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PROGRAM MANAGER

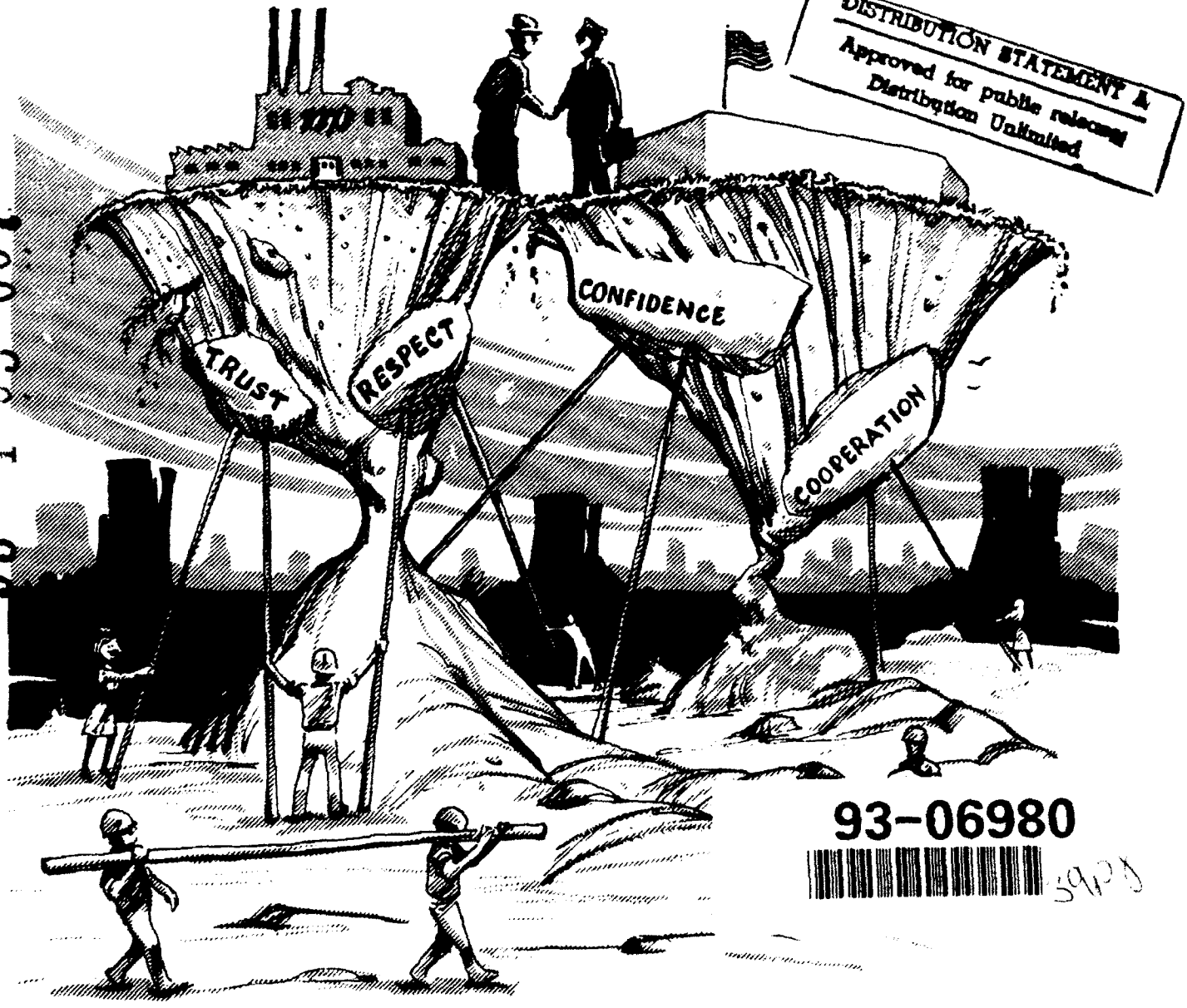
Journal of the Defense Systems Management College

Counterpunching the U-Boats

Political Process in Systems Acquisition Design

New Ethics Standards

Repairing the DOD/Industry Partnership



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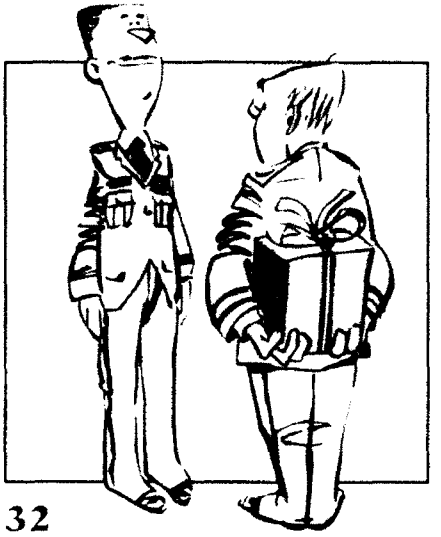

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COUNTERPUNCHING THE U-BOATS:

The Acquisition Process that Won the Battle of the Atlantic

Wilbur D. Jones, Jr.

I will show that the U-boat alone can win this war. Nothing is impossible to us.

Admiral Karl Doenitz, 1940[1]

The longest continuous battle of modern warfare raged in the Atlantic Ocean from September 1939 to May 1945 between the Allies and the German submarine forces, or U-boats *(Unterseebooten)*.

Doenitz, U-boat commander and, from January 1943 on commander of the entire *Deutsche Kriegsmarine*, fought with a single strategy: *Tonnageschlacht*. He ruthlessly drove his commanders to sink enough ships and enough tonnage to choke off Britain, an island nation limited in war resources, and her allies, to win the war in Europe for Germany.

Immediately upon Germany's invasion of Poland which precipitated the global war, Doenitz grasped the initiative at sea and held it well into the fourth year until the Allies completed mobilization and turned the tide. As the ocean conflict progressed, the outcome largely depended upon one side's continuous ability to develop and deploy countermeasures to the other's weapons and tactics — a classic war of counterpunching.

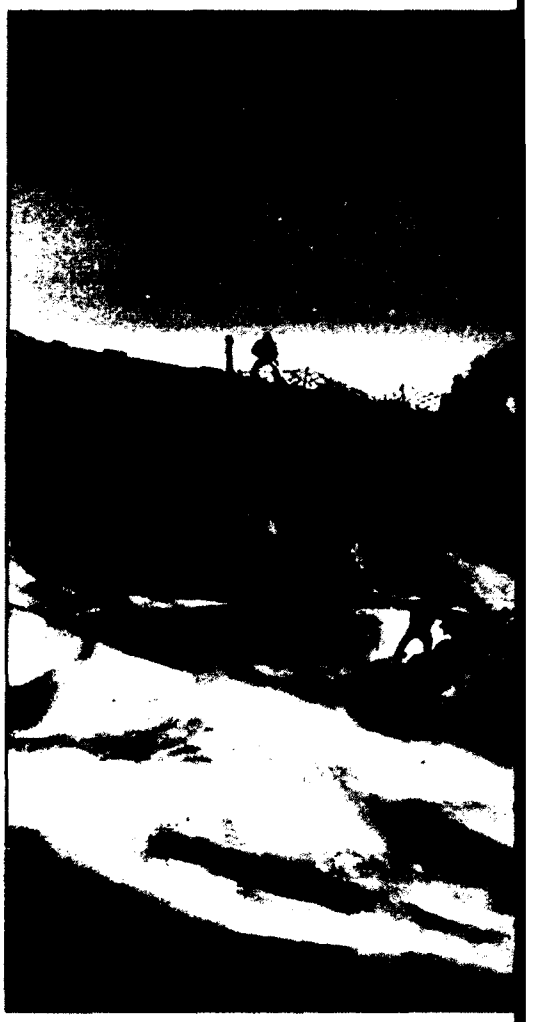
As we remember this period of 50 years ago and the zenith of the U-boat war, *Program Manager* tells this story of how the Americans combined science, tactics, industry and program management — the expedient *ad hoc* acquisition process of the time — to meet the massive life-threatening peril and win the crucial Battle of the Atlantic.

American Military Readiness

The entire German Navy will henceforth be put into the service of inexorable U-boat warfare.

Doenitz, on assuming command, January 1943[2]

The U-boat arm, building on its record in World War I, clearly led in undersea warfare. The United States had no central authority devoted to anti-submarine warfare (ASW), limited tactical doctrine, and weapons basically left over from 1918, and was unprepared for the shock which followed. The British had made the only Allied advances, mainly in sounding equipment.



In September 1939, grave shortcomings existed in the United States and Britain for organizing science for war. Both countries had developed

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Professor Jones is the DSMC Archivist and Historian. This account is taken from research on a book he is writing on the history of U.S. defense acquisition. He is indebted to the staff of the Naval Historical Center for their assistance.

important science laboratories, such as the Naval Research Laboratory (NRL) in the District of Columbia, but few scientists were attracted to government service.

A deficiency in U. S. Navy planning and strategy was its predilection for large ships and President Franklin Roosevelt's for small craft. For the required ASW destroyers, destroyer escorts and cutters, "There was nobody in Washington in decisive authority to promote the ships we actually needed," one observer noted.[3]

tional defense was compartmentalized, allocations of military hardware were divergent, and inter-service rivalries and jealousies were rampant, all undermining the armed forces' efficiency. "There was considerable fiddling in the Navy Department and the Pentagon while the ships burned."[4]

Army historians wrote that in 1939-41 "seemingly no one has seen fit to develop comprehensive plans and forces specially designed to counter the U-boat....The U. S. Navy was woefully unprepared, materially and mentally, for the U-boat blitz on the Atlantic coast that began in January 1942...this unpreparedness was largely the Navy's own fault."[5] (In retrospect, because the Navy should have taken the lead in ASW, this opinion is hardly as biased as it may appear.)

Admiral Ernest J. King, Atlantic Fleet commander, felt Roosevelt's inaccurate and unrealistic assessment of the U-boat menace was one of his "blind spots."[6] King had his own. His running skirmishes with the Army and the British Admiralty, and his opposition to anything Prime Minister Winston Churchill proposed, dragged the Allied ASW effort like an errant anchor. The British believed "King's war is against the Japanese."[7]

All photos courtesy National Archives.

***USS Borie** rammed and sank **U-405** in the Atlantic, 1 November 1943. The **Borie** suffered damage and had to be scuttled.*

King's vendetta with the Army Air Force and its commander, General Henry H. Arnold, was "a deadly serious business...carried on in the face of the enemy."[8] Navy unpreparedness left the Army Air Force in charge of coastal defense, for which nothing had been done to anticipate ASW or inter-Service cooperation. King's pique with Arnold in early 1941 delayed actions as the U-boat blitz increased. When Arnold refused cooperation, King went to General George C. Marshall, Army Chief of Staff. In July, Marshall agreed to allocate some aircraft to the Navy for ASW, but tactical and command problems remained. The ensuing ASW campaign was not purely a Navy show, and would include substantial contributions by the Air Force and Coast Guard.

Coincidentally, America's de facto entry into the war occurred on September 5, 1941, two months before Pearl Harbor, when the destroyer *USS Greer*, bound for Iceland with supplies and mail, tracked and then was attacked by the *U-652*. Each vessel fired on the other and missed.

Organizing for Research and Development

You alone can...mount an offensive against the enemy and defeat him. The time will soon come when you will be superior to the enemy with new and more

powerful weapons, and will be able to triumph over your worst foes - the aircraft and the destroyers.
Doenitz to his commanders, May 1943

While the military procrastinated, civilians associated with national defense, watching the war clouds gather over Europe, formed scientific organizations to deal with research and technical war issues.

In 1939, Roosevelt appointed Dr. Vannevar Bush as chairman of the National Advisory Committee for Aeronautics, and decreed it would become a consulting and research agency for the Joint Army and Navy Aeronautical Board in case of a national emergency. The prominent Bush, a professor of electrical engineering, inventor with business experience, former president of the Massachusetts Institute of Technology, and president of the Carnegie Institution, was well known in the scientific community and had worked on secret military projects.

Admiral Ernest J. King & Secretary of the Navy Frank Knox aboard the ***USS Augusta.***

Bush believed passionately in the importance of science in modern warfare. By mobilizing scientists to develop weapons for the European war, Bush more than any civilian was responsible for leading America's weapons efforts on ASW and other areas. In effect he was the forerunner to duties performed today by the Under Secretary of Defense (Acquisition) or, at least, the quintessential program executive officer.

Bush convinced Roosevelt in June 1940 that a new agency was needed to plan and coordinate warfare research and development (R&D) efforts. Soon thereafter Roosevelt created the National Defense Research Committee (NDRC) consisting of civilian scientists and Army and Navy representatives, with Bush as chairman. The military chiefs cooperated. In fact, Marshall was so pleased that NDRC would assume some of his research projects that he transferred funds to support it.

The NDRC's first task was to compile a list of military research projects. By December 1941, NDRC's role had expanded to conduct research through cost-basis contracts with academic institutions and industry, which would allow scientists to work in their own laboratories. The NDRC devised a streamlined contracting system so routine contracts could be processed quickly while the difficult ones required special handling. It could make contracts faster than large government agencies because the contracting officer always was available for an immediate decision.

The NDRC operated independent of the War Department and remained the spearhead organization for military R&D throughout the war. In June 1942, NDRC became part of the new Office of Scientific Research and Development (OSRD), an umbrella organization, with Bush as head. Dr. James B. Conant took his position at NDRC. The OSRD had direct access to congressional funding and could see projects through from research into prototypes and into production. Many scientists were recruited in all areas of military research.

At the same time, Secretary of War Henry L. Stimson worked with Bush to form the Joint Committee on New Weapons and Equipment which reported the scientists' ideas to the Joint Chiefs of Staff. The foundation for a close working relationship between civilian scientists and the military had been laid. Stimson continually pushed cooperation between the scientists and his agencies, and provided the impetus which broke logjams and speeded major problems to solution.

As they developed weapons, the scientists simultaneously developed the counter-countermeasures. They knew the Germans easily could reverse-engineer a system and produce a counter. Thus, the fact a weapon existed was just as much a matter of secrecy as its parts and how it worked.

Once new weapons were successfully tested for potential field use, the military pushed for further development. The NDRC awarded contracts for continued research and prototype development, and often took tested systems directly into manufacturing. Scientists often built the first lot by hand and installed the equipment in deployed units where it was immediately used in combat. The British were amazed at how speedily the

United States got a prototype into production, because the item was designed with mass production in mind. The OSRD intentionally awarded development contracts to multiple companies looking for competing designs.

The evolving R&D process dictated the form weapons took by providing both operational needs and possibilities afforded by science and available technology. It meshed the best NDRC scientists together with officers fresh from the field, and repetitively tested and redesigned a weapon to produce a final prototype. The NDRC's production contractors suggested design changes but usually produced what they were given. "Institutional prejudice and mythology, profit motive, or vested interest based on sunk costs or institutional origin played little role."[10]

The Navy Responds, at Last

> *We must conserve our strength, otherwise we will play into the hands of the enemy. It is impossible to foretell to what extent submarine warfare will again become effective.*
>
> **Doenitz to Hitler, May 31, 1943**[11]

In 1940-41, the Navy was reluctant to accept outside R&D help, a position voiced by Rear Admiral Harold G. Bowen, Director of NRL and Scientific Aide to Secretary of the Navy (SECNAV) Frank Knox.

Soon after NDRC was established, Knox asked the president of the National Academy of Sciences to recommend ways to defeat the U-boats. The distressing January 1941 report concluded: (1) good progress had been made in ultrasonic echo-ranging gear, but training was inadequate; (2) the study of audible and sub-audible sound had been neglected; (3) much more fundamental research was necessary on the transmission of sound at sea, a field led by Germany; (4) work on underwater sound and detection gear should be directed by a single unit; and (5) too much emphasis was on gadgets and not enough on basic research.

In April 1941, the Chief, Bureau of Ships, asked NDRC to tackle these ASW tasks. Section C-4 of Division 6 was organized accordingly, headed by John T. Tate, science dean at the University of Minnesota. Division 6 worked across unit lines on matters such as fire control and rocket ordnance. Previously, NDRC's ASW activities were limited to detection of magnetic masses from aircraft, development of airborne microwave search radar and oceanography research. The question was not one of more ships and aircraft, using existing weapons. The need was for better weapons, especially from aircraft, technical training and worldwide maintenance.

Tate soon had Columbia University establish a sound laboratory at New London, Connecticut, and the University of California one at Point Loma, California. Both succeeded in the areas of training. The Harvard University laboratory built the world's quietest room. The NDRC also contracted with many industry and university laboratories, including General Electric, Westinghouse, Radio Corporation of America, Bell Telephone Laboratories, Woods Hole Oceanographic Institution, and the California Institute of Technology. About 70 organizations across the country were involved in anti- and pro-submarine research. The main Navy lab continued to be NRL, but its underwater acoustics research was overshadowed by NDRC's vast network.

The Navy opened the Office of Coordinator of Research and Development within the Office of SECNAV in early 1941. Director Rear Admiral Julius A. Furer served for 3-1/2 years and "worked wonders" as the Navy's principal liaison point with NDRC.[12] Furer eventually wrote Bush: "That your group would contribute brilliant ideas and achievements to the war effort was expected, but that you would be so versatile, and that the scientists and the Navy would find themselves so adaptable to each other's way of doing business, was unexpected by many."[13]

Although the liaison was not perfect, scientists usually received the information they needed expeditiously, avoiding the regimentation which hampered the German effort. Liaison improved once the civilians proved their

*Planes from **USS Bogue** sink **U-118**, 12 June 1943. Note splash from depth charge, small splashes from machine gun fire and crewmen huddled by conning tower.*

worth and security awareness. Scientists were out to save time: they had to find the proper contact to work with and required access to military facilities. The NDRC personnel flew out of Iceland on ASW aircraft, traveled on escort carriers, destroyers, and blimps, installed and tested ordnance and instructed users near the front.

Encouraged by OSRD-Navy relations, but fearing further German submarine technological advances, Bush wrote King, doubting whether "the full significance of the modern technical trends is being weighed in the [U. S. Navy] councils where the strategic planning occurs."[14] In the meantime, the United States lacked the ASW air and surface craft to start coastal convoying until May 1942.

Depth charge attack by a US Navy destroyer escort east of Long Island sound, 6 May 1943. Note simultaneous explosion of stern rack and K-gun launched charges, probably an attack on ***U-853****.*

Between January 1941-April 1942, America suffered a defeat "compared with which Pearl Harbor was but a slap on the wrist."[15] By mid-year, Marshall, late in seeing the dangers, recognized the U-boats threatened the entire war effort and wanted to cooperate.

At the Casablanca Conference (January 1943), the Allies agreed they were losing the Atlantic war. King, now Commander in Chief of all U. S. naval forces (COMINCH), met privately with Churchill and was turned to support the agreements worked out there with Roosevelt. Subsequently, King promoted technical and tactical cooperation with the British, who still carried the major ASW load, and the Canadians. The Americans thereafter routinely swapped inspections, technical information and delegations.

Until then, King's ASW organization had been piecemeal. Vice Admiral Royal E. Ingersoll was the de facto head of U. S. ASW until early 1943, but he inspired little. King then assigned ASW duties to his regular staff, but soon realized the makeshift arrangements were unsatisfactory. In the spring of 1943, King named Rear Admiral Francis S. Low to the COMINCH staff to lead ASW, a momentous move which began to settle the ASW organizational problems. King said, "In this see-saw of techniques, the side which countered quickly, before the opponent had time to perfect the new tactics and weapons, had a decided advantage."[16] The counterpunching accelerated into high gear.

Anti-submarine wartime was now recognized as a separate and distinct discipline. The Navy also established an ASW unit under Captain Wilder D. Baker, the Navy's first information collection and analysis agency, which concentrated on doctrine, training, and standard operating procedures. Asked by Baker, Tate established within a week a group of scientists and engineers to conduct a new kind of pragmatic ASW operational research as the first researchers in sea and air combat operations.

The Tenth Fleet

> *For some months past the enemy has rendered the U-boat war ineffective. He has achieved this object, not through superior tactics or strategy, but through his superiority in the field of science....It is essential to victory that we make good our scientific disparities and thereby restore to the U-boat its fighting qualities.*
>
> **Doenitz, December 1943**

On May 20, 1943, King gingerly unified the U. S. ASW effort (some said "more for political than operational reasons") by establishing the Tenth Fleet — a phantom fleet without a single ship it could call its own — and made Low its chief.[17] Its job was to fight the war more scientifically by incorporating the operational research techniques, and to liaise within the Navy, the other Services, and OSRD. King, still shaky on ASW, told Low, "whose specialty was to think King out of his troubles," to develop an "appreciation of the antisubmarine situation."

Operating from spartan offices in a ramshackle building in Washington, the Tenth Fleet exercised control over all Atlantic Sea Frontiers and allocated ASW forces to the Atlantic commands. They controlled all long-range aircraft and certain groups of escort carriers and other escort vessels, and submarines, to act as "killer groups." Low had total control with no holds barred.

Called a "cloistered think-factory," Tenth Fleet analyzed all aspects of the

***U-117** attacked by TBFs and F4Fs of VC-1 aboard **USS Card**, 7 August 1943, central Atlantic, leading to sinking of U-117.*

U-boat war, supplied immediate information to Atlantic Fleet commands, recommended tactics and developed new hardware.[20] Consisting of some 50 officers and enlisted personnel and about 100 scientists from the ASW Operational Research Group (ASWORG), the Tenth became "the real master of American destiny in the Atlantic battle."[21]

The ASW Countermeasures: Weapons and Tactics

> *An aircraft can no more kill a U-boat than a crow can kill a mole.*
>
> **Doenitz**[22]

Allied scientists knew the importance of equipping aircraft with radar as soon as possible, since their search rate was 10 times higher than a vessel's. Ten pre-production microwave sets were hastily assembled at the Radiation Laboratory early in 1942 and put in Air Force B-18s, which sank an enemy in April. Radar increased sightings but badly executed attacks and ineffective weapons did not always kill. Soon, depth charges with Torpex (TNT, RDX and aluminum) increased destructive power by 50 percent.

The NDRC in December 1941 completed work on MAD, or magnetic anomaly detection, an airborne device for detecting a submerged submarine. By March 1942, a Navy patrol bomber demonstrated MAD's effective range of 500 feet. The navigation aid LORAN was developed to allow aircraft to mass at a given ocean point. And in December 1942, *British cryptologists* broke the German *Enigma* code, *Triton*, providing an inside look into U-boat operations.

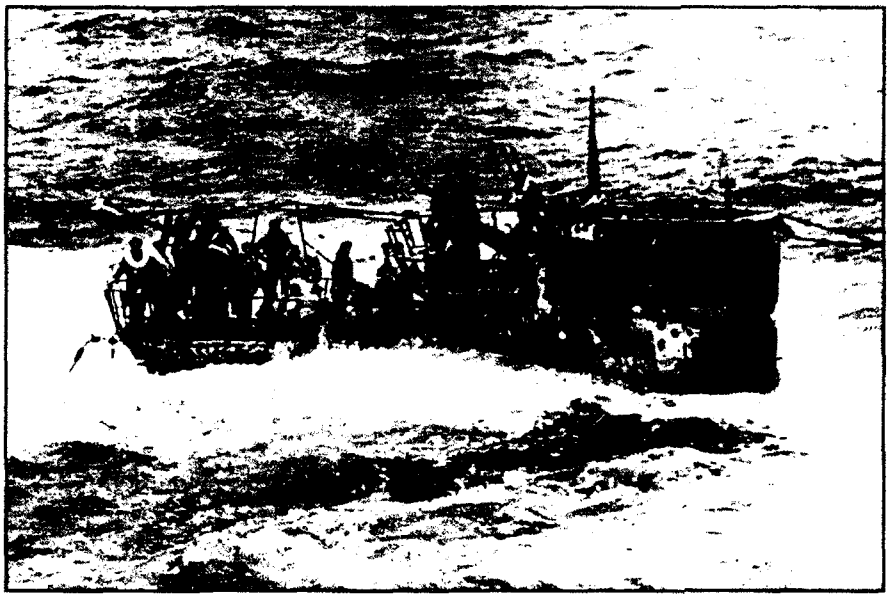
The Germans retaliated. After capturing an ASV Mark II meterwave radar unit, they installed new search receivers in the U-boats in September 1942 which indicated whenever they were engaged by radar long before detection, allowing them time to submerge. As radar contacts dwindled, the Allied counteroffensive stalled. But a technological breakthrough — a 10-cm. microwave radar which could not be intercepted — was rushed to the ASW forces such as the B-18s. The NDRC contracted with Philco and Sperry for more than 6,000 airborne radars of the 3- and 10-cm. wave lengths.

The Germans panicked as intruders pounced on their boats unawares. Believing for a year the Allies were using infrared measures, the Germans frantically tried to develop a countermeasure, but the U-boat war had been stemmed. To avoid radar, the U-boats ran submerged along transit routes through the Bay of Biscay or north of Scotland, surfaced by day to speed up, and vigorously fought back with new antiaircraft guns. They were on the defensive to stay.

By the spring of 1943, the U-boat assault had peaked and momentum swung to the Allies. The mid-Atlantic gap, a submarine refueling and resupply area, heretofore uncovered by air, came within the range of Air Force B-24s with extra gas tanks and microwave radar. Expendable radio sonobuoys dropped from aircraft and ships in patterns relayed U-boat positions at several miles to airborne killers. Escort carriers ("baby flattops") carrying Navy fighters and bombers came out of the shipyards and joined the fight in March and April. Two, the *USS Card* and *USS Bogue*, soon won the Presidential Unit Citation.

As 1943 began, not only were aircraft becoming more of a factor, the Navy shipbuilding program launched many more ASW ships including destroyer escorts, equipped with new ahead-thrown Hedgehog depth charges, Torpex, close-in detection sound gear and microwave radar. Radio direction-finding equipment (HF/DF, "Huffduff") allowed pinpoint locating of U-boats. General Electric's attack plotter entered full-scale production with a Plan Position Indicator showing the attack situation on a cathode ray tube. Other shipboard improvements were made in electronic devices and detection gear which reduced the vessel's motion, noise and reverberations.

The NDRC in 1942-43 developed acoustic mines and torpedoes called Fido, trading off acoustic steering improvements for a smaller size, speed and lethality. Conventional depth charges were redesigned to sink faster in a more predictable trajectory. The NDRC also assisted the Navy in training sonar operators and marshaled the coordinated work of underwater



***U-550** crewmen abandon ship depth charged, rammed and shelled by destroyer escorts in Atlantic, 16 April 1944. Note shell holes in superstructure.*

physics and weapon system development. Field service engineers supervised training, maintenance, debugging and reporting feedback.

But the most radical new Allied weapon was the British asdics or equivalent U. S. sonar, standing for sound navigation and ranging, developed by the Harvard laboratory. Sonar revolutionized underwater detection and positioning through improved hydrophones, a more directional projector for target depth and an improved return signal. Naval officers were skeptical at first, but they "usually experienced a conversion phenomenon at successful field trials."[23]

Navy personnel contributed mightily in sponsoring doctrine for defense, and scientists were central to sponsoring and developing offensive action concepts. But the greatest contribution made by scientists was the application of statistical analysis to operations and doctrine development. They sought a close relationship between the development of both ASW operational doctrine and equipment.

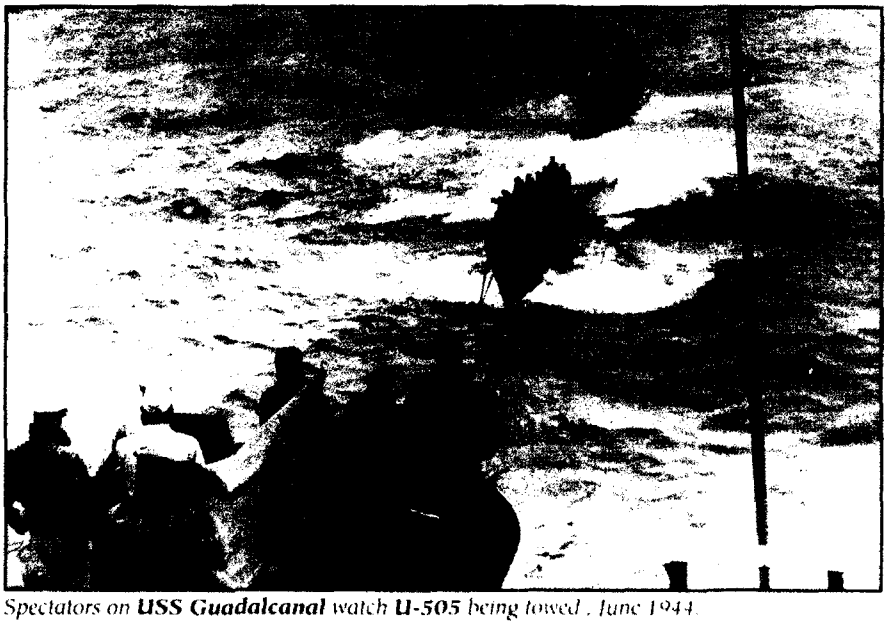
Tactics had to be improved for old gear and devised for new. The ASWORG, formed in 1942, established the basic laws of visual and radar sightings and created scientific search plans for the hunters. It stressed and developed consistency and a standard, coherent ASW doctrine. At first no U. S. search and attack data was available; so, scientists had to go to Britain.

For example, operations analysts discovered that when the U-boats heard louder and faster sonar pings, they estimated the escort's attack moment and dove beneath the sonar beam. The remedy became a creeping attack carried out by two escorts. The U-boats countered by deception: backing down, turning sharply, or ejecting chemicals creating bubble clouds, reflecting strong echoes, which simulated other targets and confused the attacker. Soon the Allies developed the means to read through the false targets.

The ASWORG was the first operational research group involved with ASW. Members made many combat trips and virtually every sizeable ASW command had a member on its staff. In 1943, the Anti-Submarine Development Detachment Atlantic Fleet was formed from ASWORG personnel to test sonar gear, analyze attacks on U-boats and develop tactics. Operational data were punched on IBM cards and analyzed by machine method.

Doenitz's scientists answered. By early 1944, U-boats received the *Schnorkel*, a retractable air intake and exhaust pipe which could be raised or lowered from inside the boat. *Schnorkel* allowed a boat to run on its diesels at periscope depth while charging its batteries and ventilating the interior. The pipe had a radar-deflective coating, making it a difficult target.

Germany began producing *Wunderwaffen* ("wonder weapons") in varieties. Stronger and quieter hulls were constructed from improved de-



*Spectators on **USS Guadalcanal** watch **U-505** being towed, June 1944.*

Admiral Karl Doenitz, German Navy.

Rear Admiral Francis S. Lowe, U.S. Navy.

signs, materials and welding methods, and with mass production methods, enabling them to dive to 600 feet and withstand increased pressure and heavy depth charges. Propulsion plants and storage batteries were improved. However, when the Germans introduced the sophisticated acoustic (homing) torpedo in August 1943, NDRC, anticipating it, had been long at work on its countermeasure, and "foxed them with great success."[24]

German engineers in the fall-winter of 1942 perfected several new weapons and countermeasures, but they started late and never could match the Anglo-American R&D effort. The U. S. work

TABLE 1. Average Monthly Shipping Losses and Construction of Allied and Neutral Nations (By Period and Cause of Loss and in Thousands of Gross Tons.)

Cause	Period I Sept 39— June 40	Period II July 40— Mar 41	Period III Apr 41— Dec 41	Period IV Jan 42— Sept 42	Period V Oct 42— June 43	Period VI July 43— May 44	Period VII June 44— Apr 45	World War II Sept 39— Apr 45
Sunk by								
U-boats	106	224	175	508	394	105	57	214
aircraft	29	61	76	70	21	35	8	41
ships	14	87	17	40	7	4	2	23
mines	58	27	20	11	9	5	15	20
other enemy action	16	5	34	26	5	2	3	12
Total sunk by enemy action	223	404	322	655	436	151	85	310
Sunk by marine casualty	58	52	40	49	55	32	39	46
Total losses—all causes	281	456	362	704	491	183	124	356
New construction	57	114	175	515	1026	1160	850	580
Net monthly *loss*	*224*	*342*	*187*	*189*	.....	.....	.....	.....
or *gain*	.....	.....	.....	.....	535	977	726	224
Shipping available in million gross tons	40.0	37.8	34.7	33.0	31.3	36.1	46.9	55.0

TABLE 2. Average Number of U-boats Sunk Monthly–World-wide by Periods and Cause of Sinking

Cause	Period I Sept 39— June 40	Period II July 40— Mar 41	Period III Apr 41— Dec 41	Period IV Jan 42— Sept 42	Period V Oct 42— June 43	Period VI July 43— May 44	Period VII June 44— Apr 45	War II Sept 39— Apr 45
Sunk by surface craft (S/C)	2.1	1.7	3.0	3.6	7.2	7.5	8.8	5.0
S/C & A/C	0.1	0.3	0.2	0.9	1.2	2.1	1.4	0.9
aircraft (A/C)	0.3	0.2	0.4	2.2	9.3	11.3	10.0	5.1
submarine	0.2	0.3	0.4	1.3	1.4	1.3	1.5	1.0
other or unknown causes	0.5	0.6	0.7	0.4	0.8	0.8	2.6	1.0
Total sunk	3.2	3.1	4.7	8.4	19.9	23.0	24.3	13.0

Source: Summary Technical Report of Division 6, NDRC, Vol. 3.

on ASW equipment faded during late 1944 as the U-boat threat began to disappear, and attention shifted to pro-submarine warfare. The Germans continued to develop new and larger hulls and systems, some of which saw limited action before the May 1945 surrender. Many American scientists would work only on weapons to win the war but not on projects maturing after the war, and some shifted their efforts to the ongoing Pacific Theater.

Both the American and German submarine forces "achieved results only when they dealt directly with engineers and scientists and fostered the combination of knowledge of scientific potential with an understanding of operational need and what fighting men could use in the field."[25]

To achieve this, particularly in the ASW effort, in the final analysis, the American science-military team essentially wrote their own acquisition rules and made whatever was there, plus practicality, work for them. And they looked for people who would say "yes."

> *...we had failed in wartime to do our utmost to expand the U-boat arm, because our political leaders and their Army and Navy advisers believed, at least until 1942, that they could win a war on land in which our opponents were the greatest sea powers in the world.*
>
> **Doenitz, post-war**[26]

Epilogue

Low, in January 1945, returned to sea as Commander, Cruiser Division 16, in the Pacific. Doenitz became German head of state when Hitler committed suicide in the war's final days and surrendered his nation to the Allies. The U-boat arm grew from 57 boats at the beginning to 1,170 boats; 863 were operational. Losses were 781, but at the end Doenitz still had 336. More than 39,000 men served in U-boats, and 32,000 found an ocean grave. "It was the worst defeat of any branch of service in any war in history," the Tenth Fleet historian noted.[27]

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Willem Hackmann, *Seek & Strike: Sonar, Anti-submarine Warfare and the Royal Navy, 1914-54* (London: Her Majesty's Stationery Office, 1984).

Montgomery C. Meigs, *Slide Rules and Submarines: American Scientists and Subsurface Warfare in World War II* (Washington: National Defense University Press, 1990).

TABLE 3. Approximate German U-boat Position (Ocean-going U-boats only–500 tons or more.)

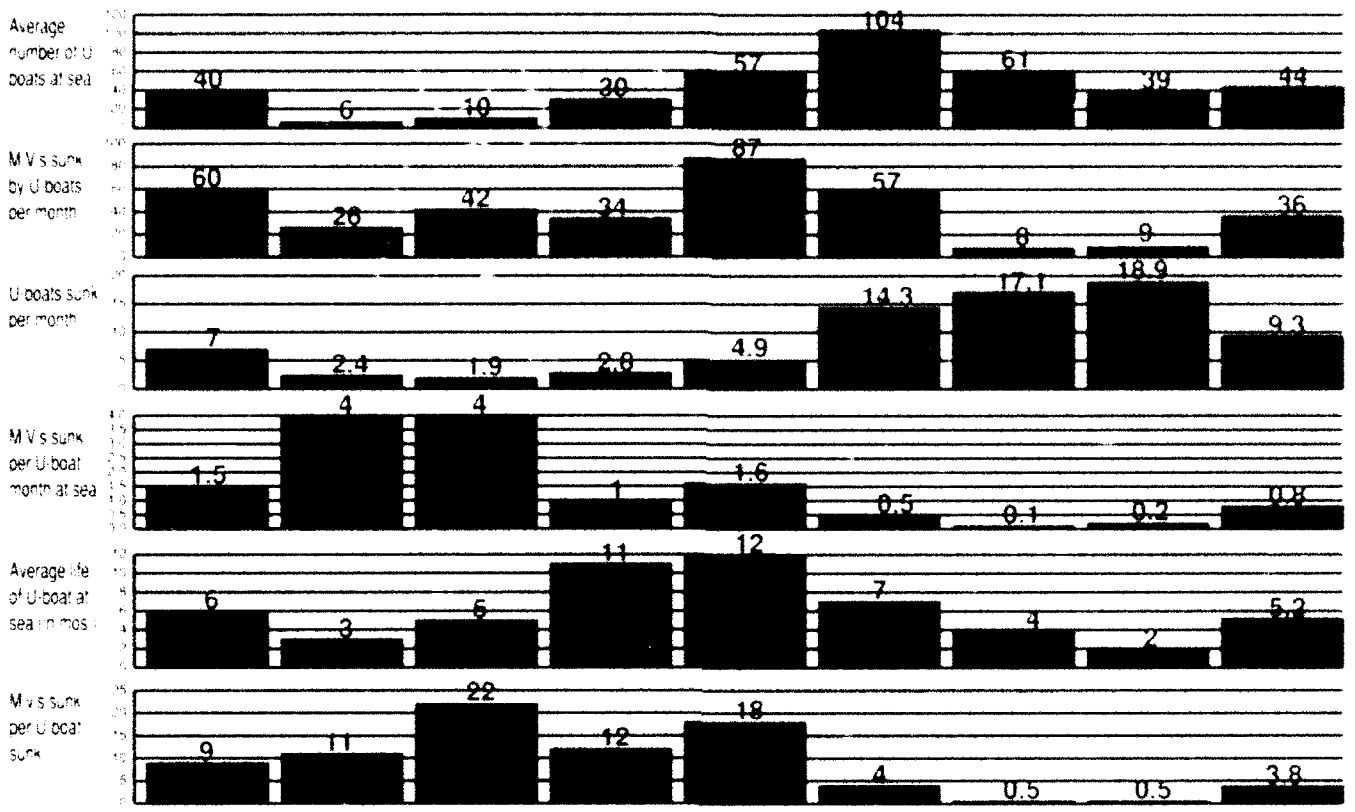
	Period	At start of period	Constructed	Sunk	At end of period
I	Sep 39–Jun 40	30	15	23	22
II	Jul 40–Mar 41	22	45	13	54
III	Apr 41–Dec 41	54	174	28	200
IV	Jan 42–Sep 42	200	200	50	350
V	Oct 42–Jun 43	350	178	142	385
VI	Jul 43–May 44	385	250	215	400
VII	Jun 44–Apr 45	400	180	234	350

Source: Summary Technical Report of Division 6, NDRC, Vol. 3.

Endnotes

1. Doenitz quoted in Baxter, p. 37.
2. Doenitz quoted in Baxter, p. 43.
3. Farago, p. 73.
4. Farago, p. 78.
5. Farago, pp. 72-73.
6. Farago, p. 78.
7. Farago, pp. 98-99.
8. Farago, p. 101.
9. Doenitz quoted in Farago, p. 184.
10. Meigs, p. 123.
11. Doentiz quoted in Farago, p. 186.
12. Baxter, p. 125.
13. Furer quoted in Baxter, p. 25.
14. Bush quoted in Baxter, p. 32.
15. Farago, p. 48.
16. King quoted in Farago, p. 237.
17. Doenitz quoted in Baxter, p. 46.
18. Meigs, p. 98.
19. Farago, p. 164.
20. Farago, p. 7.
21. Farago, p. 3.
22. Doentiz quoted in Baxter, p. 42.
23. Meigs, p. 55.
24. Baxter, pp. 33-34.
25. Meigs, p. 22.
26. Doenitz quoted in Hackman, p. 234.
27. Farago, p. 290.

FIGURE 1. U-boat and Antisubmarine Operations for the Seven Periods of World War II.



Period:	World War I Aug 1917– Jul 1918	Period I Sep 1939– Jun 1940	Period II Jul 1940– Mar 1941	Period III Apr 1941– Dec 1941	Period IV Jan 1942– Sep 1942	Period V Oct 1942– May 1943	Period VI Jun 1943– May 1944	Period VII Jun 1944– Apr 1945	Total World War II Sep 1939– Apr 1945
	M V S sunk by U b's are reduced in above table to reflect smaller tonnage of M V s in World War I.	U B activity in waters near England	U B s get French bases	Dispersion of Allied convoy routes	U B s shift to E coast of U S to attack M V s	U B s attack N Atlantic convoys in 'GAP'	U B s disperse attack supposed weak spots in S Atlantic	U B s use Schnorkel to protect themselves against A C	
	Allies used convoys during this period.	Daylight attacks at periscope depth	Operate in western approaches to England	U B s start wolf pack attacks on convoys	Losses reach peak in June 1942, 140 ships sunk by U B s	Large wolf packs overwhelm escorts	U B s stay on surface and fight back against A C	U B s operate mainly in invasion Area near England	
	Allies used hydrophones and depth charges	Allies use lightly escorted convoys	Night surface attacks on convoys	U B s move westward and southward	Extensive convoying along east coast in July 1942	V L R A C and escort carriers close 'GAP'	U B s stay on surface and fight back against A C	U B s use bottoming tactics in shallow water	
	A C generally ineffective against U B	U B's use electric torpedo no wake	Allies introduce meter radar	Allies adopt complete trans Atlantic escort	25 foot depth setting on A C depth charges	S band radar used on A C in Spring of 1943	A C get heavy losses on U B s	U B s lose French bases move to Norway	
		Allied S C use asdic successfully	3 leading U B aces lost in March 1941	U S escorts sail with convoys in September 1941	U B s driven away from east coast of U S	A C attacks much more effective	U B s forced to adopt maximum submergence	U B s still ineffective due to lack of mobility	
				Drop in effectiveness of U B s due to rapid expansion of U B personnel		U B s badly beaten in attacks on convoy O N S 5 in March 1943	U B s lose offensive power as a result of loss of mobility	Allied S C using Squid and Hedgehog in addition to depth charges inflict heavy losses on Schnorke U B s	
				U S enters war in December 1941		U B s withdraw from N Atlantic	U B s use acoustic torpedo and G S R for S band radar		

M V Motor vessel/ship

Source: Summary Technical Report of Division 6, NDRC, Vol. 3.

Getting the DOD/INDUSTRY PARTNERSHIP *Back on the Right Track*

Dr. Robert F. Burnes

The Department of Defense (DOD) and Industry relationship (the military-industrial complex) has long been described as a partnership, where each needs the other to accomplish an objective. When thinking of a partnership, one thinks of cooperation, positive spirit, and a can-do attitude with both parties operating toward a common goal and, perhaps most importantly, mutual trust. Webster defines a partnership as "a relationship resembling a legal partnership and usually involving close cooperation between parties having specified and joint rights and responsibilities."

The Problem

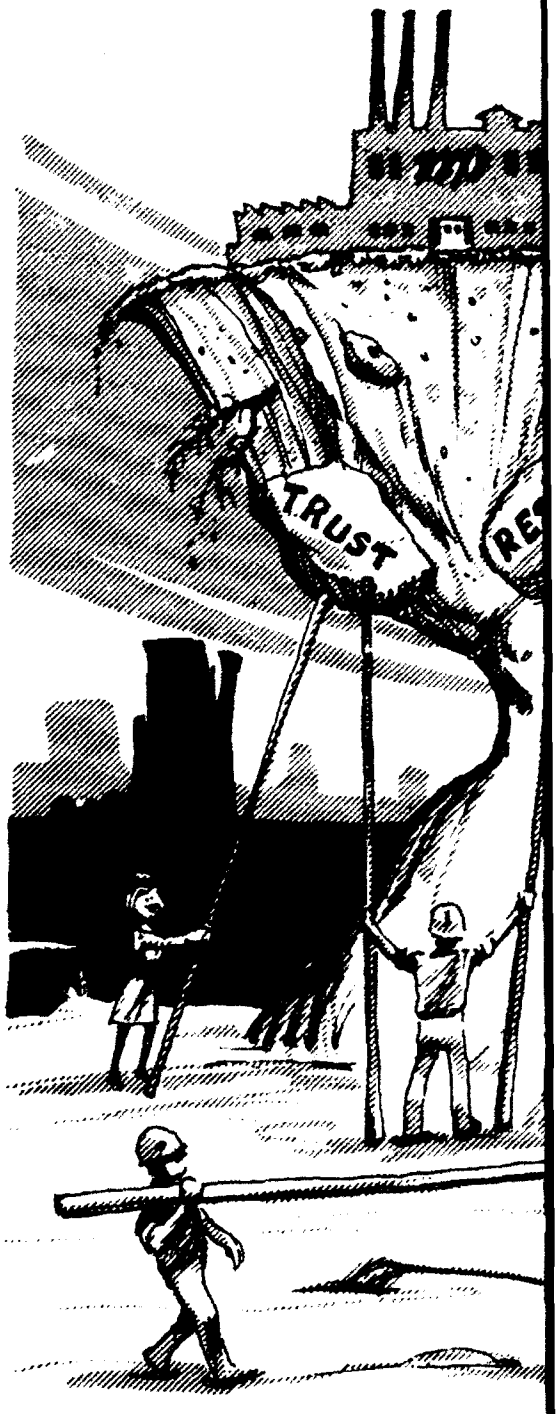
Before joining the Defense Systems Management College (DSMC) in April 1991, I spent 29 years in industry supporting DOD and NASA acquisition programs. I have seen this partnership deteriorate from one where programs in trouble were the exception, to the current environment where programs not in trouble are the exception. "Not in trouble" equates to meeting technical specifications, completed on time and within budget.

The DoD-Industry partnership today is characterized by mutual mistrust, disrespect, lack of confidence and fingerpointing, with the two parties usually pulling in opposite directions. Virtually anyone in the business for 2 years or more, as a government or industry employee, will have "horror stories" to illustrate perceived incompetence of the other side. Surely any partnership so characterized is doomed to failure and ultimate collapse. The only questions are: When and how?

Collapse of the DOD-Industry partnership transcends political affiliation. It would destroy our industrial base and have a catastrophic impact on our national economy, which, in turn, would imperil national security. This collapse must never happen.

The Beginning of a Solution

The magnitude of this problem, together with the fact it has been 30 or more years in the offing, make this a formidable problem to attack. As we know, even the biggest of elephants is eaten "one bite at a time." This article represents the first step in a long-term research project I am currently formulating with a three-fold objective: stem progressive erosion of the DoD-Industry relationship, stabilize the relationship, and restore that relationship to an effective partnership.



Dr. Burnes is a professor of Systems Acquisition Management and director of the Executive Management Course at the Defense Systems Management College.

The DSMC offers the ideal environment for conducting such a project. First and foremost, it serves all the military services and members of the defense industry. Second, it is an educational institution that strongly promotes practical research and consulting by the faculty. Third, it adheres to a strict non-attribution policy, thereby encouraging candor in all aspects of its teaching, research, and consulting. Finally, DSMC has high-level visibility within DOD because the Commandant reports to the Under Secretary of Defense for Acquisition.

The Course

Because of the magnitude and scope of the problem being addressed, the research project will itself be multifaceted, encompassing teaching, research and consulting. The core of the project, however, will reside in a new short course whose primary objective will be to make DOD and industry students aware of underlying causes contributing to the problem; more importantly, what each of them can do now to solve the problem. In this regard, the course will focus on developing solutions that are specific and practical. The remainder of this article concentrates on this course which is under development. As the project unfolds, future articles will concern other facets of the project and how they relate to the course and to each other.

The following paragraphs describe the proposed course as it is envisioned. I want to emphasize this description is based on a need as I see it, based upon my observations and experience in the business during the last 30 years and innumerable discussions with many colleagues during that time. Clearly then, more input is required, starting with feedback from you after reading this article. Nothing about the course described below is cast in concrete at this time, including its content, structure, and duration. These decisions will be finalized only after sufficient additional data/feedback have been collected and analyzed. This article is but one of the vehicles to be used to collect the additional data required.

Content

The course will concentrate on macro areas that have been identified as sources of major contributors to the current adversarial nature of the DOD-Industry relationship. The exact number of areas is to be determined, but current thinking has targeted four: Requests For Proposals (RFPs), Proposals/Source Selection, Relationship Between Government Technical and Contracts Communities, and Legal Considerations.

Requests for Proposals (RFPs)

During my 30 years in this business, I have been directly involved in responding to more than 100 RFPs issued by the Office of the Secretary

of Defense (OSD), all military services, NASA Headquarters, and each NASA Center. Each RFP solicited engineering services, with contract values ranging from $100,000 to $88 million. My experience in this area has shown that the typical RFP issued by the government is internally inconsistent; contains unnecessary boilerplate material; and exudes a kind of gamesmanship, particularly with respect to the actual intent of the contents of Section M, Evaluation Factors for Award. Each of these factors causes grief (time and money) to contractors preparing proposals in response to an RFP. The potential severity of such shortcomings in RFPs is magnified when one realizes that the RFP is, in fact, the very genesis of a DOD-Industry partnership (a contract).

To date, government efforts to rectify the above kinds of problems have manifested themselves in the forms of pre-proposal conferences and draft RFPs. While the intent of these would-be solutions is certainly commendable, the truth is they have failed to solve any problem mentioned above. Why? The typical contractor's objective is to extract the maximum amount of information possible from draft RFPs and pre-proposal conferences, while, at the same time, providing no information that might aid the competition in any way. Therefore, virtually every member of a contractor-proposal team is instructed by their management not to make comments or ask questions via either of these vehicles. Thus, rather than solving the problem, pre-proposal conferences and draft RFPs actually contribute to the problem by interjecting extra time and costs into the procurement process without producing any substantive results. Should/can we eliminate pre-proposal conferences and/or draft RFPs from the acquisition process?

I am convinced each of the above problems, and others which may be identified later, has one or more practical solutions needing to be developed, evaluated and implemented.

Pressure on the government technical community is to do the right things to get the job done...pressure on the government-contracts community is to do things right and save the government money.

Proposals/Source Selection

Regarding proposals and source selection, critical questions need to be addressed. Why are so many proposals unresponsive to government requirements, and how can they be made better? Why is the source-selection process (from submittal of initial proposals to contract award) so long, and what can be done to shorten it? How can a proposal written in 30-60 days take 1-2 years to evaluate? Are Best and Final Offers (BAFOs) and Best and Really Final Offers (BARFOs) necessary, as the government suggests, or are they merely an auction whose main purpose, as industry says, is to drive down contractor bids and thereby allegedly save the government money? Given that the last is so perceived by industry (whether or not it's true), then BAFOs in and of themselves may be a source of built-in schedule and cost overruns on contracts. Should/can BAFOs be eliminated altogether? If so, how?

Relationship Between Government Technical and Contracts Communities

The pressure on the government technical community is to do the right things to get the job done. At the same time, the pressure on the government-contracts community is to do things right and save the government money; "doing things right" is defined as satisfying the Inspector General's requirements, regardless of the resulting impact on getting the job done. There is no doubt that in the current DOD "get-more-for-less" environment, these two sets of pressure will continue to be exerted. At best, these two pressures are somewhat incompatible; at worst, they are mutually exclusive. This situation presents a dilemma for the contractor who is required to "serve two masters" with often conflicting requirements. This lose-lose position definitely contributes to an adversarial relationship between the contractor and either or both of the two government communities.

Legal Considerations

Certainly the legal community (within government and within industry) had a significant impact upon the DOD acquisition process. Anybody who attended a debriefing for an unsuccessful offeror will tell you that most of the time the entire thing is a charade, where industry and the government "talk to" each other through, and with the prior approval of, a bevy of attorneys on each side. The greater the dollar value of the contract, the greater the number of attorneys present at the debriefing. My experience has shown that such debriefings are conducted by the government solely to comply with the letter of the law in the Federal Acquisition Regulation (FAR), with no intent to inform the offeror of the real reason(s) they were unsuccessful (which is, in fact, the alleged purpose of such a debriefing). This being the case, maybe we should eliminate these debriefings altogether and save the wasted time, costs and ill-will they generate.

Via the on-again, off-again Procurement Integrity Act, the legal community has managed to confuse everyone in government and industry regarding when the acquisition process actually begins. Everyone involved has an opinion. The problem is that everyone's opinion is different, and no one knows (or is willing to state) which opinion is correct. The result is that contracting officers and contractors never know when industry can legally talk to government technical personnel to identify and understand their requirements for upcoming procurements. Besides the obvious frustration involved for both sides, this "indecisive legal inaction" further inhibits the exchange of technical information between government and industry. Such an exchange is basic and vital to an effective DOD-Industry partnership.

It has been suggested that the legal community in our business spends much too much time figuring out why we can't do something rather than directing their energy toward figuring out how we can do something (in terms of acquisition strategies). If true, how should we go about redirecting their efforts?

As mentioned, the four macro areas already discussed are not meant to be exhaustive; they are illustrative of the kinds of topics to be presented and discussed in the proposed course. As is evident from the foregoing, these macro areas can be controversial at best, and devastating (to the DOD-Industry partnership) at worst.

One further word with respect to macro areas. Each is not an independent entity. To the contrary, they are interrelated to one extent or another. Thus, when analyzing each area to develop alternative solutions, we must be careful to avoid the pitfalls of suboptimization at the expense of "the system." In our case, the system is the DOD-Industry partnership so that is the level we want to optimize, not the individual macro areas. In analyzing each macro area, we must follow through any proposed changes to assess their collective impact on the overall partnership, not just on the individual macro area. For our purposes, we will define the partnership as beginning with the start of the acquisition process (once attorneys agree on what that is) and continuing through to the completion of a contract, including government acceptance of required DD Forms 250.

The problem is that everyone's opinion is different, and no one knows (or is willing to state) which opinion is correct.

Structure

As envisioned, this course will combine classroom instruction, forums and a workshop. Senior personnel from DOD and defense industry acquisition communities will present real-world problems experienced in each macro area comprising the course, along with alternative solutions.

Immediately following, the presenter will be joined by a counterpart from the government or industry to host a forum with course attendees, focusing on particular problem(s) and alternative solutions just presented. This approach will be followed for each of the four macro areas discussed. The course will conclude with a workshop when attendees will work in groups to identify a problem contributing to the current DOD-Industry adversarial relationship (which may or may not be related to any of the macro areas discussed) and develop alternative solutions to the problem. Each group will brief the rest of the class on the problem(s) identified and alternative solutions.

To encourage maximum participation and meaningful discussion, the course will be designed to be portable (offered throughout the country, not just at DSMC). Attendees will be split between government and industry with both technical and contract communities represented.

Duration

Duration of the course will be a direct function of the final list of macro areas selected, what they are and how many there are. As a benchmark, one week has been selected as a nominal target.

The Next Step

The next step is up to you, the reader. In keeping with the most fundamental tenets of total quality management (determine customer needs, get everyone involved), I solicit your written comments on the proposed course in terms of content, structure, and duration. You may use the pre-addressed survey form on page 17 or write me directly. In either case, DSMC's strict non-attribution policy will apply to all responses. Your candid comments and suggestions are critical to ensure the proposed research project will provide a meaningful and significant beginning toward getting the DOD-Industry partnership back on the right track.

The time has come when I want to do everything I can to restore the effectiveness of this partnership. I am reminded of the following anonymous quotation that recently appeared in a DSMC internal communication: "The man who removes a mountain begins by carrying away small stones." Are you willing to "carry away a small stone or two?" I hope so.

Write me with your thoughts on re-establishing an effective DoD-Industry partnership.

1993 ACQUISITION RESEARCH SYMPOSIUM

ACQUISITION FOR THE FUTURE
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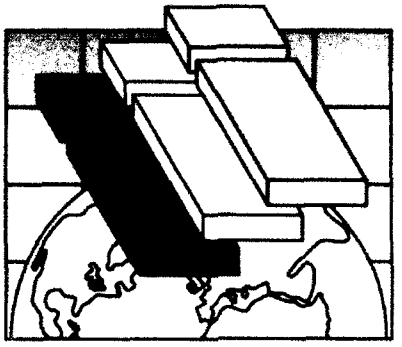

The 1993 Acquisition Research Symposium is the latest in a series of conferences that began in 1972. The Symposium is a dynamic forum for dialogue among key professionals working on vital issues facing the acquisition community. This year's Symposium is co-hosted by the Defense Systems Management College and the National Contract Management Association, Washington DC, Chapter.

PLENARY SPEAKERS

James A. McDivitt, Senior Vice President, Government Operations & International, Rockwell International **(Keynote)**
Rear Admiral William L. Vincent, USN, Commandant, Defense Systems Management College
Deborah L. Wince-Smith, Assistant Secretary of Commerce for Technology Policy

PANEL PRESENTATIONS

Joint Logistics Commanders (invited)
International Perspectives of Acquisition
The Industrial Base — Progress or Poverty?

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Acquisition research papers presented during approximately 32 concurrent sessions will provide a dynamic forum for dialogue with key professionals working on vital issues facing the acquisition community.

REGISTRATION INFORMATION

Sessions will run from 0830 Tuesday, June 22, 1993, to 1200 Thursday, June 24, 1993.

Symposium Registration. Registration fees are $195 (advance registration) and $245 (after May 30, 1993) and include a copy of the Proceedings, two lunches, coffee breaks, and a reception Tuesday evening. Attendance will be limited to 450 on a first-come, first-served basis.

Hotel Rates and Registration. Hotel rates are $110 per night. For reservations, call the **Holiday Inn Crowne Plaza, 1750 Rockville Pike, Rockville, MD, (301) 486-1100.** To receive these rates, state that you are attending the Acquisition Research Symposium and make reservations no later than **May 21, 1993**, identifying yourself with **Group 8732, NCMA.**

REGISTRATION FORM

***Pre-Registration*: $195.00**
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***Late Registration*: $245.00**
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Substitutions may be made at any time. Cancellation must be made 30 days before the Symposium. Cancellation fee is **$50.00**

Mail this registration form (or facsimile) with check, purchase order or training form payable to:

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Business Phone _____

Position _____

Please identify any special accommodations required (i.e., special diet, or auxiliary services such as deaf interpreters).

_____

_____

PROJECT SURVEY FORM

Yes, I am interested in DSMC's proposed research project to get the DOD-Industry partnership back on the right track.

Additional Macro Areas to Be Considered and Their Relationship to the DOD-Industry Partnership:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Comments/Suggestions on Proposed Course Content, Structure, and Duration:

_____

_____

_____

_____

_____

_____

_____

Are you willing to participate in the proposed research project?

☐ Yes ☐ No

If yes, how? (Check all that apply)

☐ Guest speaker at course
☐ Research respondent
☐ Other (please specify) _____

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WELDING

Effective Flexible Process

William T. Motley

Welding is the metal joining method wherein localized fusing is produced either by heating the metal to suitable temperatures with or without the application of pressure, or by the application of pressure alone, and with or without the use of filler metal.[1]

or

A process whereby two metals are melted and resolidified to form a solid connection.[2]

or

By the application of intense heat, metal at the joint between two parts is melted and caused to intermix. Upon cooling and solidification a metallurgical bond exists. The final weldment has the potential for exhibiting at the joint the same strength properties as the original unjointed metal.[3]

Welding performs an important function in the fabrication of metal products since it is one of the most effective and flexible processes in joining metal sections. In many instances, welding not only produces more permanent joints and simplifies operation, but it increases the strength and improves the appearance of the finished structure. Most metals in use today can be welded, some more easily than others.

Metal Inert Gas (MIG) welding using a flux core wire vice inert gas as a shielding agent.
Photo courtesy of the Lincoln Electric Company, Cleveland, Ohio.

...welded structures are superior in many respects to riveted structures, castings, and forging. It is for this reason that welding is widely used in the fabrication of building, bridges, ship, oil-drilling rigs, pipelines, spaceships, nuclear reactors, and pressure vessels.

Before World War II, most ships and other structures were riveted; today, almost all of them are fabricated by welding. In fact, many of the structures presently being built — space rockets, deep-diving submersibles, and very heavy containment vessels for nuclear reactors — could not have

Mr. Motley is the chair of the Manufacturing Management Department, Defense Systems Management College.

been constructed without the proper application of welding technology.[4]

Some designers exhibit an innate fear of welding born by some experienced failure. Some designers compare a weld with a cast structure which automatically implies brittleness. Where, in truth, the failure was the result of poor design or improper processes. A properly designed and manufactured weldment can have a strength as great as the base metal. However, there is no perfect manufacturing process. Welding, as this paper will outline, presents its own special problems.

Potential Advantages of Welded Structures Over Riveted Structures[5]

—Reduction in fabrication cost and time

—No limit on thickness

—Simplified structural design

—High joint efficiency

—Water and air tightness

—Weight saving.

Types of Welding

There are different types of welding, each with its economic and technical advantages and disadvantages.

—Forge welding:
- A. Manual
- B. Machine
  1. Rolling
  2. Hammer
  3. Die.

—Gas welding:
- A. Oxyacetylene
- B. Oxyhydrogen
- C. Air acetylene
- D. Pressure.

—Resistance welding:
- A. Spot
- B. Projection
- C. Seam
- D. Butt
- E. Flash
- F. Percussion
- G. High frequency.

—Induction welding, high frequency

—Arc welding:
- A. Carbon electrode
  1. Shielded
  2. Unshielded.
- B. Metal electrode
  1. Shielded
     a. Shielded arc
     b. Atomic hydrogen
     c. Inert gas
        -gas metal arc
        -gas tungsten arc
     d. Arc spot
     e. Submerged arc
     f. Stud
     g. Electroslag
  2. Unshielded
     a. Bare metal
     b. Stud.

—Other welding processes:
- A. Electron beam
- B. Laser welding
- C. Friction welding
- D. Thermit Welding
  a. Pressure
  b. Nonpressure
- E. Flow welding
- F. Cold welding
  a. Pressure
  b. Ultrasonic
- G. Explosive welding
- H. Diffusion welding.

Welding Process Variables

—Proper joint design for a given load and application; shear, torsion, fatigue, etc.

—Workmanship and proper procedures:

—Operator skill and experience

—Material fit-up and fixturing. The closer the mechanical fit between the metals to be welded together, the better the weld. Fit-up can constitute 80-90 percent of the total weld time. Any joint should, where possible, be fixtured to be welded in the flat position (downhand). The closer two metals are in thickness, the easier it is to weld them.

—Cleanliness of joint surfaces and protection from oxidation while welding. Any weld is improved by increased cleanliness, protection from moisture and protection from oxidation. This can include mechanical cleaning to bare metal, solvent wipe and then, during welding, the use of inert gas to protect the weld puddle. The number one problem in welding is the prevention of oxidation.

—Proper equipment for the metals and thicknesses involved.

—Proper selection of materials; electrode (filler) compatibility with base material.

—Proper control of weld puddle temperature, the rate of metal temperature increases and decreases, and ambient air conditions.

—Preheat and postheat.

—Strict process control and reliable nondestructive test (NDT) techniques.

Problems with Welded Structures (Varies with the metal and the technique used)

—Cracking (welds are breeding grounds for cracks)

—Difficult to stop fracture once initiated because welding creates a monolithic structure with no "tear stoppers."

—Decreased sectional area and stress raisers:

-End of welds

-Porosity

-Slag inclusions

-Craters

-Incomplete fusion

-Inadequate joint penetration

-Undercuts and overlaps

-Arc strikes.

—Lack of completely reliable NDT techniques.

—Residual stress and distortion. Reduction of distortion from welding is possible but elimination is extremely difficult. Residual stresses resulting from welding may require heat treating to relieve.

—High susceptibility to stress corrosion cracking and corrosion fatigue. Beware of highly loaded weldments operating in or near sea water.

—Welding alone, without stress raisers, reduces fatigue strength. Welds, even if perfect, act as stress concentrations. Even greater reductions in fatigue strength occur if a weld is made in a structure where there is a change in cross section. Weldments that are more than adequate in static strength may be completely inadequate in fatigue loading.

Program Office Concerns

—The development of mobile, minimum weight structures operating under high stress, that are of welded construction, present the strong possibility of developing technical problems. In any welding the goal is to produce weldment with properties the same as the base metal. This is difficult even with common metals but becomes extremely difficult with high-strength metals. The welding of dissimilar metals greatly increases technical difficulties.

—Welding is strongly process dependent. A successful welding operation can suddenly begin to produce defective weldments if the approved welding process is changed or not followed.

—With regard to design allowables for weldments and accepted welding procedures, many situations arise where there is no industry consensus. In these situations, analysis confirmed by full-scale testing may be the only recourse.

—A smooth, attractive weld only indicates an accomplished welder...not a good weld. There is a better chance of a good-looking weld being structurally sound but this can be misleading. Welding depends as much on workmanship as on science. The workmanship (or art) portion has brought about the certification of welders by bodies like the American Welding Society and the American Society of Mechanical Engineers. There are military standards concerning certification of welders.[6] Certification of welders and availability of reliable NDT techniques are important aspects of any critical welding process.

—Technical experience plays a major role in producing successful welds, especially with high-strength metals. The PMO must ensure that the prime contractor and subcontractors involved in producing critical weldments are technically qualified. Preferably this technical qualification is based upon a successful past history.

Shielded metal arc welding (stick) of heavy pipe.
Photo courtesy of the Lincoln Electric Company, Cleveland, Ohio.

Footnotes

1. Anonymous. Updates USAF AFSC training document.

2. W. Motley.

3. *Production Processes*, Bolz. Roger W., Industrial Press, Inc., New York 1981, p. 53-03.

4. *Analysis of Welded Structures*, Masubuchi, Koichi., Pergamon Press, New York, 1981, p. 1.

5. *Ibid*, pp. 1-2.

6. MIL-STD-1595A, MIL-STD-248D and MIL-STD-2219.

THE POLITICAL PROCESS IN SYSTEMS ARCHITECTURE DESIGN

Designing Politics In

Brenda Forman, Ph.D.

Your program may be the most revolutionary weapon system since gunpowder, elegantly engineered and technologically superb, but if it is to have real life-expectancy, its managers must design the politics in as assiduously as the technology, producibility, reliability or maintainability. High-tech, high-budget, high-visibility programs are far more than engineering challenges; they are political challenges of the first magnitude. The bottom line is: If the politics don't fly, the hardware never will.

Politics is a determining design factor in today's high-tech engineering. Its rules and variables must be understood as clearly as stress analysis, electronics, or support requirements. However, its rules differ profoundly from those of Aristotelian logic and its variables are bewildering in their number, complexity and, often, downright orneriness.

In addition to the formal political institutions of the Congress and the White House, your program must deal with a political process including interagency rivalries, intra-agency tensions, dozens of lobbying groups, influential external technical review groups, powerful individuals within and outside government and, always and everywhere, the media.

These groups, organizations, institutions and individuals interact in a process of extreme complexity. This confusing and at times chaotic process determines budgetary funding levels that either enable the engineering design process to go forward—or more often, of late, impose constraints upon that process; i.e. in the forms of budget cuts, schedule stretch-outs, technical reviews, reporting requirements, and/or threat of cancellation. Understanding its ways, and dealing successfully with it is crucial to program success.

Begin by understanding that power is widely distributed in Washington. There is no single, clear-cut locus of authority to turn to for support for long-term, expensive programs. Instead, support must be continuously and repeatedly cobbled together from a grabbag of widely varying groups, each of whom may perceive the program's expected benefits in different ways. Many of those group interests may diverge sharply when the pressure is on.

This broad dispersion of power repeatedly confuses anyone expecting that somebody will really be in charge. Rather, the opposite is true: Anything that happens in Washington is the resultant of dozens of political vectors, all pulling in different directions.

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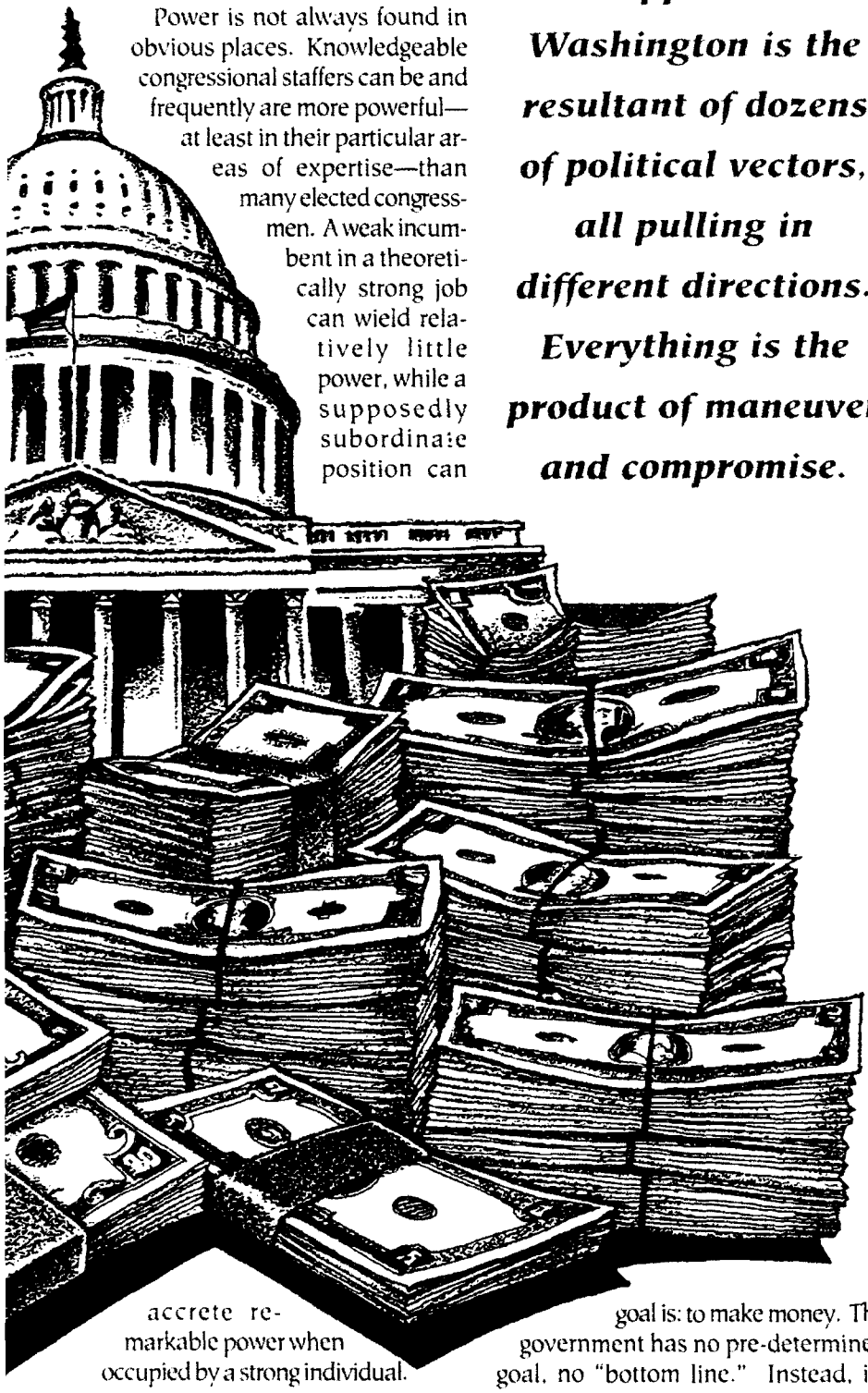
Everything is the product of maneuver and compromise. When those fail, the result is policy paralysis—and, possibly, program cancellation.



Power is not always found in obvious places. Knowledgeable congressional staffers can be and frequently are more powerful—at least in their particular areas of expertise—than many elected congressmen. A weak incumbent in a theoretically strong job can wield relatively little power, while a supposedly subordinate position can accrete remarkable power when occupied by a strong individual.

Anything that happens in Washington is the resultant of dozens of political vectors, all pulling in different directions. Everything is the product of maneuver and compromise.

There are no clear-cut chains of command in the government. It is nothing like the military or, even, like a corporation. A corporation knows what its goal is: to make money. The government has no pre-determined goal, no "bottom line." Instead, its function is to decide what its goal should be by resolving all wildly conflicting goals and interests of this huge, various and cantankerous nation into some agreed-upon consensus that will permit the ragged, unwieldy machinery of government and policy to move forward. This is a difficult task in any society but it is a herculean undertaking in a country as diverse as this one.

The process gets more complicated because power does not stay put in Washington. The big quadrennial shifts after a presidential election are only the beginning. Power relationships are constantly changing, sometimes quietly and gradually, other times suddenly, under the impact of domestic or international crisis; e.g., collapse of the Soviet Union, Iraq's invasion of Kuwait, Los Angeles riots, or a scandal at high levels. These shifts can alter the policy agenda—and therefore funding priorities—suddenly and violently. A current example is the contest concerning future defense spending levels in the wake of the end of the Cold War.

The entire process is far better understood in dynamic terms as a continuous ebb and flow of power and influence between the Congress and the White House, among and within rival agencies and among ambitious individuals. Through it all, everyone is playing to the media, particularly television.

To deal effectively with this process, the first skill to master is the ability to think in its terms. That requires understanding that the political process functions in terms of an entirely different logic system than the one in which scientists, engineers and military officers are trained. Washington functions in terms of the logic of politics. It is a system every bit as rigorous in its way as any other, but its premises and rules are profoundly different. It will, therefore, repeatedly arrive at conclusions quite different than those of engineering logic, based upon the same data.

Scientists and engineers are trained to marshall their facts and proceed from them to proof; proof is a matter of firm assumptions, accurate data and logical deduction. Political logic is structured

entirely differently. It depends not on logical proof but on negotiation, compromise and appearances; proof is a matter of "having the votes." If you can muster votes in the Congress to pass your budget, your program is worthy, useful and beneficial to the nation. If you cannot muster votes, no matter what its technological merits, your program will lose to other programs whose supporters can win the votes.

Getting votes depends only in part on engineering or technological merit. These are always important—poor design or faulty engineering usually will undermine a program. Getting votes often depends as much, or even more, on how skillfully the program supporters have distributed the program benefits in terms of jobs and revenues among the districts of powerful members of the Congress.

One veteran of the political wars in Washington (experienced enough to require anonymity!) said:

> Might makes right in D.C., and might comes out of the appropriations process. This was one of my rude awakenings. The basic principle is: If you're right, you can get enough people to support your position. If you can't, then you weren't right! I knew I was right. I had undisputable facts. That didn't matter. Truth is forged by majority. That's the democratic process.

In addition to the highest engineering skills, the successful design engineer must have an intimate understanding of this process. The alternative is to be blindsided repeatedly by political events and, worse yet, not to comprehend why.

There are five basic concepts for navigating these rocky rapids. I call them "The Facts of Life." They often are unpleasant facts of life to the dedicated engineer but are perilous to ignore. Understanding them, on the other hand, will go far to help anticipate problems and cope more effectively with them. They are:

There are five basic concepts for navigating rocky rapids. "The Facts of Life" are unpleasant to the dedicated engineer but are perilous to ignore.

—Politics, not technology, sets the limits of what technology is allowed to achieve.

—Cost Rules.

—A strong, coherent constituency is essential.

—Technical problems become political problems.

—The best engineering solutions are not necessarily the best political solutions.

Fact of Life #1: Politics, not technology, sets the limits of what technology is allowed to achieve.

If you can't get the funding, your program will die, and getting the funding, not to mention keeping it over time, is a political undertaking. Funding or, rather, lack of it sets limits considerably narrower than what our technological and engineering capabilities could accomplish in a world without budgetary constraints. Our technological reach increasingly exceeds our budgetary grasp. This is intensely frustrating to the creative engineer. It is, however, a hard, inescapable fact and will not go away.

Fact of Life #2: Cost rules.

High technology gets more expensive each year. As a result, the only pockets deep enough to afford it are increasingly the government's. The fundamental equation to remember is: Money = Politics.

Funding won in one year, moreover, does not stay won. Instead, it must be fought for afresh every year. With few exceptions, no program in the entire federal budget is funded for more than 1 year at a time. Each year is, therefore, a new struggle to head off attackers wanting your program money spent elsewhere, to rally constituents, persuade waverers and, if possible, add new supporters.

This is an intense, continuous and demanding process requiring huge amounts of time and energy. Corporate chief executive officers (CEOs), high-ranking administration officials and military officers spend much time in the halls of the Congress and/or testifying to congressional committees to make the case for individual programs. Where professional lobbyists are involved, as they often are, the process requires money; sophisticated skills required to influence the political process do not come cheap. After one year's budget is passed, it starts again, because there is always next year.

Keeping a program "sold," is a continuous political exercise. Like the heroine in the old movie serial, "The Perils of Pauline," your program probably will have to be rescued from sudden death on a regular basis.

Fact of Life #3: A strong, coherent constituency is essential.

No program ever gets funded solely, or primarily, on the basis of its techno-

logical me" or engineering elegance. By and large, the Congress doesn't care about its technological or engineering content, unless, of course, those run into problems (see Fact of Life #4). Instead, program funding depends directly on the strength and staying power of its supporters; i.e., its constituency.

Assembling the right constituency can be a delicate challenge because a constituency broad enough to win necessary votes in the Congress easily can fall prey to internal divisions and conflicts. On the other hand, a tight, homogeneous constituency is probably too small to win the necessary votes.

Constituents support programs for many reasons, from the concrete to the idealistic. Inevitably, constituencies are typically heterogeneous coalitions of organizations and individuals inside and outside the government proper, with political fault lines running through them, ever ready to fracture under conflicting political pressures. The art of politics is knitting diverse motivations together firmly enough to survive successive budget battles, and keep your program funded. It can require the patience of a saint coupled with the wiliness of a Metternich, but such are the survival skills of politics.

Fact of Life #4: Technical problems become political problems.

In a high-budget, high-technology, high-visibility program, there is no such thing as a purely technical problem. Program opponents will be constantly on the lookout for ammunition to attack your program. Technical problems are tailor-made to that end.

Such ammunition comes frequently to hand, moreover, because large, "big-ticket" programs routinely are subjected to repeated in-depth scientific and technical reviews by governmental organizations: like the General Accounting Office (GAO); Congressional Research Service (CRS); and, non-governmental groups like the National Research Council (NRC) or the Defense Science Board (DSB).

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Some reviews are mandated by the Congress as part of program funding legislation. Others are self-initiated by outside groups in the scientific and technical communities. Some (notably GAO reports) are instigated by individual members of the Congress hostile to the program in question, and looking for sticks with which to beat it. Not infrequently, they find it, inasmuch as any program stretching the technological envelope inevitably will encounter technical difficulties at some stage. The political result is that presumably "technical" reports immediately and inevitably become political events as opponents berate the program for its real or perceived shortcomings.

Dealing with such problems is more difficult because scientific and engineering knowledge is rare to non-existent in the Congress: out of a total 535 lawmakers, there were, perhaps, eight engineers in the last Congress. Thus, congressmen probably have little ability to assess the true nature or seriousness of program technical challenges. Worse, they may have little desire to do so if they want to cut or cancel a program's funding.

Judicious damage control is required constantly. Reports from prestigious scientific groups like NRC or DSB routinely will precipitate congressional hearings in which hostile and friendly congressmen will pit expert witnesses against one another. The program's fate may depend heavily not only on the expertise but on the political agility and articulateness of supporting witnesses. While such hearings will spend much time on presumably technical issues, the fundamental and absolutely determining consideration is always affordability—and affordability is decided by whichever side has the most votes.

High-tech engineering design operates in a political fishbowl; unless the program is classified, which simplifies its life considerably because it limits participants in its budgetary battles. This technique has a limited future because many programs have been "turned black" to avoid unremitting public scrutiny and constant attacks to which large, long-term, high-budget programs are subjected. This has caused the Congress to grow impatient with what it sees as evasion of its rightful oversight prerogatives, and may result in limits for program classification.

Fact of Life #5: The best engineering solutions are not necessarily the best political solutions.

Remember, we are dealing here with two radically different logic systems. Requirements of political logic repeatedly run counter to those of engineering logic. Take construction schedules, for example. In engineering terms, an optimum-construction schedule makes the best and most economical use of

resources and time, and yields the lowest unit cost. In political terms, the optimum-construction schedule is the one the political process decides is affordable in the current fiscal year. These two definitions routinely collide: the political definition always wins.

The government functions on a cash-flow basis. Long-term savings usually will be foregone in favor of minimizing immediate outlays. Overall life-cycle economies of scale repeatedly will be sacrificed in favor of slower acquisitions and program stretchouts; because these require lower yearly appropriations, even if they cause higher unit costs and greater overall program expense.

In short, technological merit is essential and engineering elegance always must be sought; but, funding that makes either one possible is a function of interaction between costs and constituents where determining consideration is always "affordability." In general, that means near-term rather than overall affordability.

It can be a bewildering and intimidating process to the uninitiated. But it need not be so! In addition to being confusing and chaotic, this is a profoundly interesting and engrossing process, every bit as challenging as the knottiest engineering problem. Indeed, it is an engineering challenge because it molds the context in which systems design must function.

You may find the craziness of the political process distasteful, but it will not go away. The politically naive program managers will experience more than their shares of disillusion, bitterness and failure. Politically sophisticated program managers will understand the basics of political knife-fighting and know how and when to summon allies to their program's defense.

That doesn't mean you must become an expert lobbyist. It means you must understand the political context within which your program must function, the budget battle's rules of engagement, and factors that conduce to success or failure.

You must understand the political context within which your program must function, the budget battle's rules of engagement and factors that conduce to success or failure.

Following are basic coping skills for the successful program manager. First and foremost, understand that the Congress and the political process are the owners of your project. They are your clients. It is essential to deal with them accordingly by making sure they understand what you are trying to do, why it is important, and why it makes political sense for them to support you.

Be informed. This is your life so be active. Learn the political process for yourself and keep track of what's going on. Figure out what information the political system needs to understand what you need and give it to them. Your chief engineer has different information requirements from your congressional oversight committee. Learn what information furthers your program's fortunes in Washington and get it to your congressional liaison people to give to political decision-makers determining your program's funding. Maybe your program has a job-multiplier effect in a crucial lawmaker's district. Maybe program technology has potential commercial applications in areas where the United States is losing a competitive battle with another country. Maybe you have a few thousand voters willing to write, telephone or sign a petition to your congressman. The point is that the political process bases decisions on different information than does the engineering process. Learn to satisfy both sets of requirements.

Consider a quote from ex-astronaut, now space entrepreneur Joe Allen:

> Over the years, the people at NASA have been extraordinarily good at building things that were impervious to unexpected things happening to them. They've done this via back-up mechanisms. Why can't we come forward with a program that has some protection in its engineering against funding vagaries? Do some back-up engineering? Maybe we can't match the impedances — engineering impedance is totally different from political impedance — but at least we could try.

That's an idea worthy of serious examination. Is it possible to develop techniques of "defensive engineering?" Is it possible to build-in fallback positions to allow a program to recover in case of funding catastrophes? As Allen says, maybe we can't match the impedances, but it's at least worth thinking about.

Only when they are not understood do the "Facts of Life" instill cynicism or a sense of powerlessness. Once understood, they are tools in the hands of the astute manager to pursue his or her program success. Success in that undertaking yields the inimitable satisfaction of winning in one of the toughest games going. It is not incomprehensible; it is merely different.

UPDATED DSMC HANDBOOK

Meeting Requirements of Warranty Law

Calvin Brown

Title 10, Section 2403, of United States Code requires that a warranty be considered for inclusion in the procurement of major weapons systems. Perhaps no other provision of the defense acquisition reform initiatives of the 1980s has proved so unwieldy to implement. June 1987 and September 1989 General Accounting Office audit reports leveled considerable criticism at Department of Defense warranty implementation and administration. The armed services have been criticized by their internal audit/inspection agencies for weapon systems warranty indiscretions. Many germane and perplexing questions persist.

—How should complex weapon system essential performance characteristics be warranted?

—What should a warranty cost?

—Do assurances exist that the benefits of a warranty will prove cost-effective?

—Can realistic, measurable and enforceable terms and conditions be developed?

—Who will administer the warranty and how?

—Under what conditions are such warranties inappropriate?

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The Department of Defense and the armed services have addressed these questions through policy directives, guidance documents, research contracts, workshops, audits, and myriad techniques. However, it is incumbent upon program managers to exercise considerable thought and effort to enact weapon system warranties that comply with the spirit and letter of the law. Formidable problems are manifested by military supply-maintenance interfaces and automated systems that were not designed to accommodate warranties. Accordingly, warranties have worked "around the system" rather than "through the system."

The Warranty Guidebook, an updated version of the prior Warranty Handbook published in 1985, is designed to assist program managers in the military services to meet the requirements of warranty law. It incorporates experience gained in the past 7 years. It is not a cookbook to follow in prescribed measures for guaranteed results; nor is it intended to be directive.

Chapter headings are as follows:

Chapter 1: Introduction
Chapter 2: Warranty Definitions, History, Law and Policies
Chapter 3: Warranty Concepts
Chapter 4: Warranty Selection and Structure
Chapter 5: Warranty Development
Chapter 6: Warranty Administration
Chapter 7: Warranty Cost-Benefit Analyses
Chapter 8: Lessons Learned

Useful appendices include text of the warranty law, 10 USC 2403; the implementing Defense Federal Acquisition Regulation, DFARS 246.7; Service implementing regulations; warranty focal points and warranty checklists. Program managers must remember the intent of the Congress was to purchase weapon-system warranties that are meaningful and make good business sense. Despite challenges inherent in development and administration, weapon systems warranties can be successful.

Government personnel may obtain a copy of this handbook by writing to: DSMC, Director of Publications (RD-P), Fort Belvoir, VA 22060-5426.

THE CARBURETOR AND ELECTRIC CREDO

Think and Do Good Work

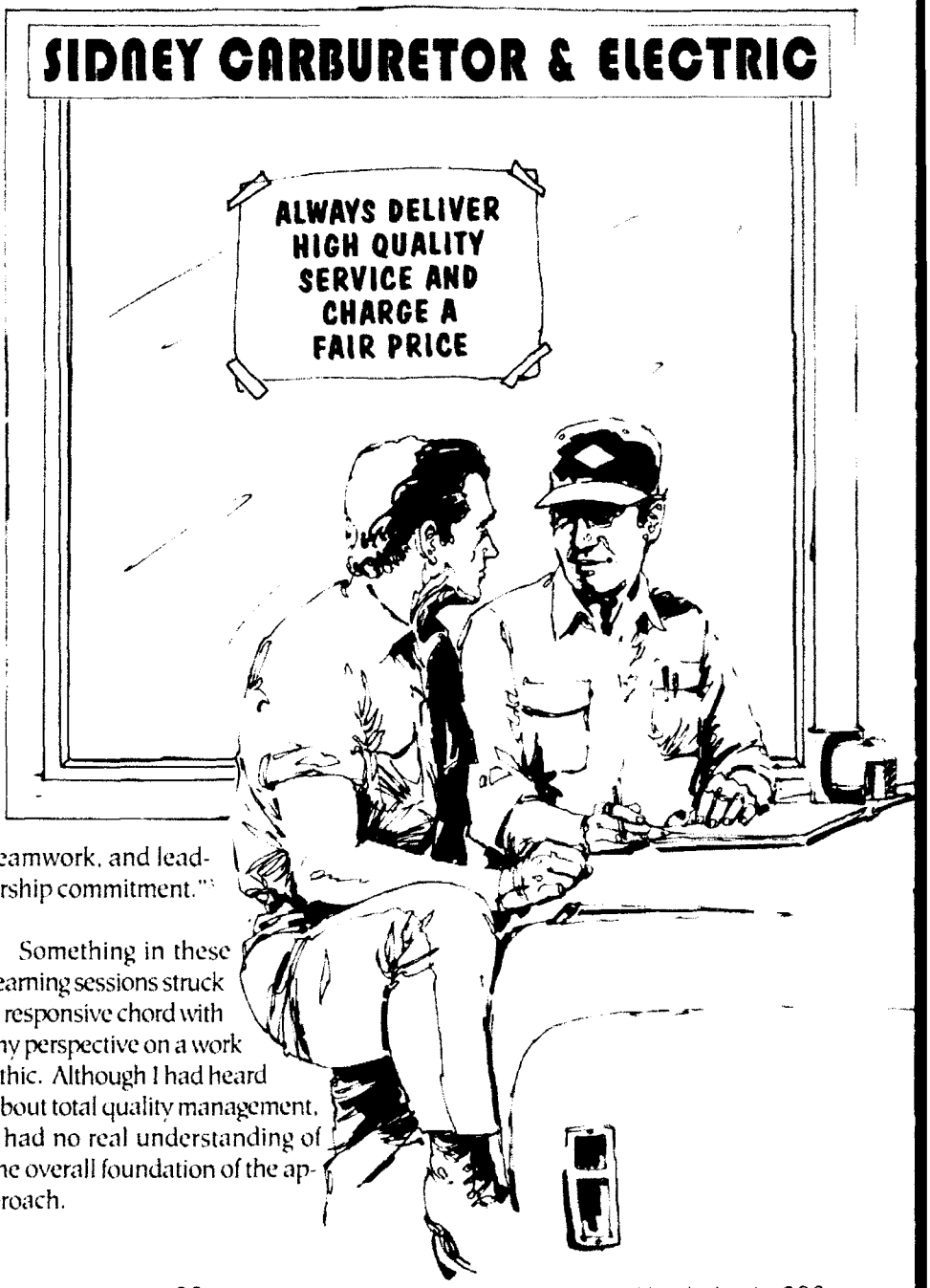
Lieutenant Colonel Scott Rounce, USAF

In the early days of Program Management Course 92-2 at the Defense Systems Management College (DSMC), our class was introduced to a concept called the "Total Quality Paradigm." There are three inherent concepts implied in this term.

The first is Quality. According to Professor Dan Robinson, "Quality is consistent conformance to customer expectations," or, more directly, "Quality...is whatever the customer says it is."[1]

The second inherent concept is a Paradigm. Joel Barker, in his video tape *Discovering the Future: The Business of Paradigms* says a paradigm "sets the boundaries of our thinking," and "provides us with rules and regulations we use to solve problems."[2]

The third inherent is Total Quality. Professor Robinson summarizes the total quality concept in seven elements: customer focus, systems perspective, process management, continuous improvement, individual involvement, teamwork, and leadership commitment."[3]



Something in these learning sessions struck a responsive chord with my perspective on a work ethic. Although I had heard about total quality management, I had no real understanding of the overall foundation of the approach.

This is the description of a learning journey experienced during the Program Management Course. Lieutenant Colonel Rounce does not assert it is profound but it focused key insights for him, and it may for you. The author graduated with PMC 92-2 the past December.

We also were being introduced to total quality in the managerial development curriculum, and embarking on an individual learning program which opened the door to studying various subjects relating to management. I viewed Tom Peters' video tape entitled *In Search of Excellence*, where he used examples of companies particularly successful in implementing key aspects of total quality management. Peters cited McDonalds Restaurants which believe quality is the only way to win, and that the key to quality is people. They have a fundamental belief in the value of their products, and they care deeply about what they do. The IBM exemplified a company respecting the individual and bases all work on high ideals, morals and ethics. Other examples mentioned by Peters were: North American Tool and Die which believes in encouraging innovation and the precept that management must be absolutely honest, thereby maintaining credibility; and Apple Computer and 3M who believe companies should encourage risk-taking and employee involvement, and that they should recognize people for their contribitions and reward them when they succeed. The premier example shown in the tape was Stu Leonard's food store where enormous success was achieved by listening to the customers.[4]

All the while I was viewing this videotape I felt myself cheering inside. There was a resonance with my fundamental beliefs, and yet I found myself thinking "This is not rocket science. These things should be common sense to everyone."

At this point I discovered a book by Robert Fulghum entitled *All I Really Need to Know I Learned in Kindergarten*. Harvard University and the Wharton School of Finance may not recognize this as a landmark text in management theory, but there is a common theme paralleling all the other inputs I was receiving. Some key lessons Fulghum cites are:

—Share everything.
—Play fair.
—Don't hit people.

Why does this all sound so familiar? Why does it ring so true? Lessons had been learned in a small farming town in Montana.

—Put things back where you found them.
—Clean up your own mess.
—Don't take things that aren't yours.
—Say you're sorry when you hurt somebody.
—When you go out into the world, watch out for traffic, hold hands, and stick together.

And then remember the Dick-and-Jane books and the first word you learned—the biggest word of all—LOOK.[5]

I contend one could do an extensive mapping of these lessons back into the TQM philosophy and cover nearly all bases. That is not the purpose of this paper (although it would be interesting). What struck me again was the profundity, yet simplicity, of Robert Fulghum's management principles, and how well they reflected the keys to success in business.

At this point in my learning experience I paused to ask myself two questions: "Why does this all sound so familiar?" "Why does it ring so true?" It occurred to me that I had seen a total quality workplace very early in my life, long before I knew what running a business meant.

In a small farming town of about 5,000 people in eastern Montana there is an automotive repair shop, Sidney Carburetor and Electric. It was started in 1952 and has grown steadily for 40 years. Its business centers on the repair of carburetion, ignition and electrical systems of automobiles and farm machinery, and small-engine repair. The number of employees has ranged from 2, for the first 10 years or so, up to 5 or 6 presently.

The company management philosophy can be summarized in terms I will call the "Carburetor and Electric Credo." They follow.

Rule 1: Always Deliver High-Quality Service and Charge a Fair Price

The customer will recognize the quality and will be willing to pay for it, thus obtaining the best value.

There was a weathered sign hanging on the shop's wall for many years which read something like: "There will always be a business that can perform a job a little cheaper, a little faster, and with a little less quality. Those who consider only these factors are this man's rightful prey." Prices at this shop were often a little higher than competitors, but customers always returned.

Rule 2: Whatever Task You Undertake, Be the Best There Is at That Task

The owner of this business was reared with the guidance that there is no shame in being a trash collector, or a ditch digger, or whatever, as long as you are the best ditch digger there is. This trait permeated the business, and there was never any question that this place was the best there was.

Rule 3: Don't Lie, Cheat, or Steal

In "A Quality Ethics Model for Managers," Professor Forrest Gale suggested a series of "decision-maker tests" a manager could use to determine he/she was making an ethical judgment. These included:

—The Golden Rule: Is this how I would want someone else to treat me?
—Publicity: How would I feel if this decision was published on the front page of tomorrow's paper?

—Kid/Spouse on Shoulder: How would I feel if my son/daughter/spouse observed me making this decision?"

In *The Power of Ethical Management*, Ken Blanchard and Dr. Norman Vincent Peale posed a similar test, but went so far as to add an additional test at the beginning which was: "Is this decision/action legal? Could I be arrested for this?"[7]

The fact that authors and lecturers are becoming millionaires by giving this advice is mind-boggling. Do not misunderstand me. I applaud them for not letting these lessons be overlooked in the stampede for quick-fix self-actualization, but these are not rules or characteristics we should have to pay someone to tell us. In *The Seven Habits of Highly Effective People*, Stephen Covey contends that greatness comes from adopting a "Character Ethic" paradigm; that is, the foundation of success comes from things like integrity, humility, fidelity, courage, justice, patience, industry and the Golden Rule. The character ethic teaches there are basic principles of effective living, and that people can only experience true success and enduring happiness as they learn and integrate these principles into their basic character.[8]

I dwell on this point because it was the most fundamental tenet of the company being discussed. Ethics in business was so woven into the fabric of the Carburetor & Electric management that it was not even considered an issue.

Rule 4: Always Give Your Customer the 13th Donut

This rule had its basis in the proverb of the two bakers on main street. One always had customers lined up out the door, while the other could barely stay in business. One day the second baker asked the first what his secret to success was. The first replied, "When a customer orders a dozen donuts, I always give him thirteen to show how much I appreciate his business." Dr. Deming might call this delighting your customer.

The character ethic teaches there are basic principles of effective living, and that people can only experience true success and enduring happiness as they learn and integrate these principles into their basic character.

Rule 5: Take Care of Your Customer in the Hard Times and He Will Take Care of You

Often, farmers bringing work into the shop could not pay, because their harvest was not yet in or, in worse cases, their entire year's crop had failed. Management knew customers and knew work would be paid for eventually. By looking after customers' needs when they were strapped, the business ensured that farmers probably would keep coming back when fortunes reversed.

Rule 6: Be Willing to Lose Some Business in the Short Run to Maintain Integrity

There were times when customers would demand that their work be done before anything else in the queue. This became a greater challenge for good-paying customers who did much business with the company. However, if other commitments had been made to others, even big customers waited. This did not always endear those people and occasionally they would leave in a huff vowing to do future business elsewhere. After cooling off they usually returned, but those who did not were good riddance.

Rule 7: Give Borderline Job Applications a Chance

One day, a young man came into the shop looking for a job. He was qualified and had good raw talent. Unfortunately, he had been fired from two other local shops for being unable to get along with co-workers and customers. The owner at Carburetor and Electric gave him a job, worked with him, and empowered him with trust and responsibility. That young man now owns a controlling interest in the business.

Rule 8: Give Employees the Latitude to Try New Tasks, Discover Better Ways to Do Old Tasks, and Function as a Team

What is so special about this particular business? Nothing, really. It is representative of thousands of small businesses. How did management learn state-of-the-art management techniques when Dr. Deming was beginning work and no one had heard of Tom Peters? The owner/manager of Sidney Carburetor and Electric learned values and techniques from his father who ran a car dealership for more than 50 years. And his father learned from his grandfather. I suspect you could trace many generations back in history to trace the lessons.

I believe Stephen Covey's explanation of the need for a new character ethic in this country is correct. This research found that in nearly 200 years of writings concerning success, almost all literature in the first 150 years or so focused on the character ethic. Most of the success literature of the past 50 years was superficial. This more recent *Personality-Ethic* focus was filled with social-image consciousness, gimmicks and quick fixes.[9] The Carburetor and Electric Credo has its roots in the writings of people like Benjamin Franklin.

My conclusion is there is no magic in the TQM paradigm. The lessons are sound and they have been proven for hundreds of years. However, these techniques were taught to me under a different title—*Common Sense*. I learned them from the owner/manager of Sidney Carburetor and Electric, my father. He didn't know the seven elements of the total quality concept. He boiled it down into two: think, and do good work.

When these rules were coupled with examples that appeared in everyday life, the result was a potent work ethic which has been remarkably successful in an 18-year military career. Obviously, if you believe Tom Peters' examples, they work in large corporations as well. The secret, if there is one, is to live what you believe.

Endnotes

1. Robinson, Dan. "Total Quality Paradigm." Teaching Note, Managerial Development Department, Defense Systems Management College.

2. Barker, Joel A. *Discovering the Future: The Business of Paradigms*. Video.

3. Robinson.

4. Peters, Tom, and Bob Waterman. *In Search of Excellence*. Video.

5. Fulghum, Robert. *All I Really Need to Know I Learned in Kindergarten*. Ivy Books, 1988.

6. Gale, Forrest. "A Quality Ethics Model for Managers." Teaching Note, Managerial Development Department, Defense Systems Management College.

7. Blanchard, Kenneth, and Dr. Norman Vincent Peale. *The Power of Ethical Management*. Audio Tape.

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9. *Ibid.*

NEW ETHICS STANDARDS SIMPLIFY THE RULES

Fourteen Principles

James D. Alstott

On February 3, 1993, new Standards of Ethical Conduct took effect for all employees of the Executive Branch. The new standards represent a major change in approach to the subject, and its impact will be felt by every Executive Branch employee. For those in the acquisition business, it means there is now a clearer set of standards by which people can guide their activities. For government contractors, it will make it easier to do business with different agencies, because all executive agencies now are under the same standards.

Unfortunately, the new rules with explanatory material spanned 60 pages of fine print when published in the *Federal Register*. The sheer volume of the material presents a daunting reading assignment for anyone wanting to understand the rules, much less comply with them. This article will ease the task by offering an overview of why and how the new standards came into being, then briefly describe the main points of the new standards.

Background

During the past several years, as stories of alleged misbehavior continued to make headlines, the Congress and the White House made several attempts to ensure Executive Branch employees knew what conduct was permissible and what was prohibited. It seems that new restrictions would appear in law or by Executive Order every time a new scandal broke, or a political point needed to be made. Though an Office of Government Ethics (OGE) was created in 1978 to oversee executive branch ethics, there was little effort to ensure there remained a clear, objective and enforceable set of standards that employees could look to for guidance.

The Packard Commission, in its review of the defense department, realized this was a major area of confusion. Of the 55 recommendations made in its final report, nine addressed the subject of ethics or standards of behavior. Realizing the importance of the subject, President George Bush established, with his first executive order, a commission to recommend ethics law reform; the commission issued its report in March, 1989.

Shortly thereafter the President directed the U.S. Office of Government Ethics to "establish a single, comprehensive and clear set of executive-branch standards that shall be objective, reasonable and enforceable." A few months later, the Congress enacted the Ethics Reform Act of 1989 which focused statutory authority to issue ethics regulations on the OGE.

New Single Standard

In the past, more than 100 federal departments and agencies strove to comply with various ethics statutes and orders by issuing their own codes and standards. Eventually it became apparent that these codes and standards were not consistent throughout the Executive Branch. One example is

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Mr. Alstott retired in 1992 from the U.S. Air Force, having held various acquisition positions, like contracting officer. He is chairman of the National Contract Management Associations Acquisition Ethics Committee.

the question of accepting coffee and donuts during the course of meetings at a contractor's plant. Some agencies strictly prohibited acceptance under any circumstances, others required some form of payment, still others had no policy on this subject.

To eliminate such inconsistencies, the new standards replace virtually all individual agency standards, thus providing uniform regulations for all employees of the Executive Branch. To keep the standards truly uniform, the new regulation prohibits supplementation by an agency without concurrence of the OGE. The regulation states agencies may not be more restrictive in their supplements than is this new standard.

Some agency-specific statutes are not covered by this regulation; the affected agencies will continue to issue standards under those laws. The Defense Department is preparing a consolidated supplement that will cover all DOD-specific statutory requirements. It will replace individual military department and DOD agency regulations just as the OGE has consolidated the standards for the entire Executive Branch. Still, to the extent that employees in various agencies have the same duties and responsibilities, they now have the same standards of ethical conduct to guide them.

Basic Principles for Public Servants

The new standard starts with a list of 14 principles defining the basic obligations of a person in public service. They are shown in figure 1. The principles form the basis of the specific standards of behavior that follow in the regulation. The concepts do not represent a major change from those included in previous codes, though wording was changed or added to keep the regulation comprehensive and clear.

The concept underlying the principles is that public employees are agents of the public as a whole. Historically, the principal-agent relationship requires the agent to protect and pursue interests of the principal (in this case the general public), while the principal pays the agent according to their agreement or written contract. The principal entrusts his well-being into the care of the agent; the agent, in turn, should be diligent in representing his principal. It would be a violation of trust for an agent to use his position to further his own, private interests while purporting to be acting in his "agent" capacity.

It is vital that this principal-agent concept be recognized and upheld, or a complex society such as our own cannot function. Virtually everyone relies on this concept in their personal affairs, and employers expect employees to be trustworthy agents while representing the company. However, it is difficult to clearly define the trust relationship when the principal is an entire nation, and the nearly 1 million civilian agents (plus those in uniform) have diverse responsibilities and duties.

It is worth noting that the 14th principle sets the standard for judging the propriety of specific behavior. Rather than imposing mechanical formulas across the board, the OGE chose to use a "reasonable man" test as the basis for judgment. This frees those involved to consider relevant facts whenever a question arises, instead of requiring the continual checking of tables and formulas. There are time and dollar limits stated in the regulations, but they typically arise out of previously existing statutes, or are used to define what a "nominal value" is.

Specific Provisions

Following the principles is a listing of seven areas where certain types of conduct are specifically regulated. For each area the new regulation provides extensive explanations, gives definitions, describes exceptions, and provides examples to illustrate either acceptable or prohibited behavior. The seven areas are:

- Gifts from Outside Sources
- Gifts Between Employees
- Conflicting Financial Interests
- Impartiality in Performing Official Duties
- Seeking Other Employment
- Misuse of Position
- Outside Activities.

The following is a summary of each of the areas. Please note that the intent here is only to provide an initial understanding of the standards. For official guidance consult the text of the standards or the Designated Agency Ethics Official for your command.

Gifts from Outside Sources

An employee is prohibited from soliciting or accepting a gift given because of his official position or from a prohibited source.

The underlying principle is that an employee should not accept gifts he would not, except for his official position, otherwise receive. Though the term "gift" includes almost anything of monetary value, numerous exceptions are listed. These exceptions include modest refreshments offered during meetings, gifts motivated by family relationships, and travel in connection with employment discussions. Returning to the coffee and donuts example, the new standard permits acceptance, and does not require payment for them, assuming a reasonable person would not think doing so was improper.

Gifts between Employees

An employee is prohibited from giving, donating to, or soliciting contributions for a gift to an official superior and from accepting a gift from an employee receiving less pay than himself, except in certain circumstances.

Here the regulation seeks to preserve a proper supervisor-employee relationship. Except for special occasions such as marriage, retirement, or reassignment, gifts are not to be given or solicited. However, carpooling is not considered a gift situation if each participant shares a proportionate part of the cost and effort involved.

Conflicting Financial Interests

The rules relating to existing financial interests are divided into two parts.

First, an employee must disqualify himself from acting in an official capacity where he has a direct and predictable personal interest.

Second, certain agency statutes prohibit employees from acquiring or holding particular financial interests, if doing so might give the appearance of impaired objectivity.

This provision deals with actual conflict of interests between the government and the employee's personal estate, those of his spouse, minor child or business partner. Since there are possible criminal penalties involved, whenever an employee thinks there may be a conflict, he should discuss this with his supervisor at the earliest time possible, carefully review the laws, and seek legal advice.

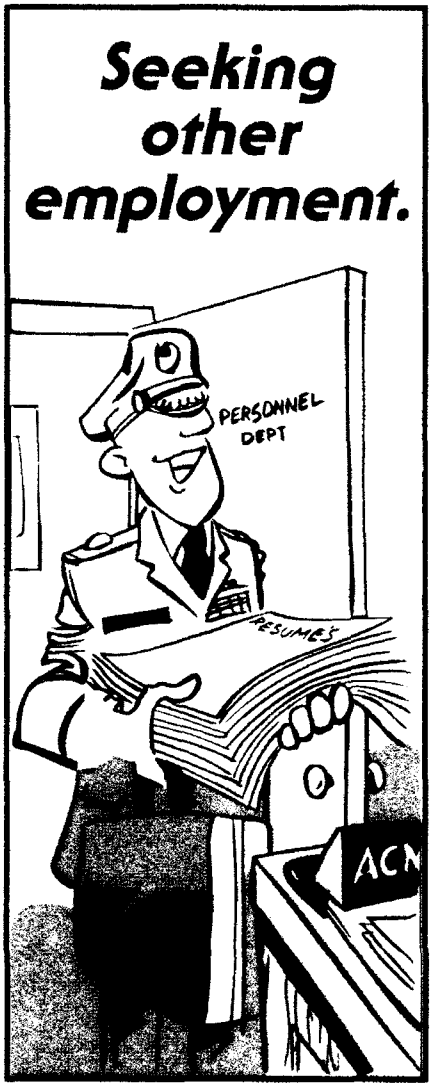
Impartiality in Performing Official Duties

This provision intends to ensure that an appearance of loss of impartiality does not occur. Employees must remove themselves from participating in decisions when a reasonable person might question the impartiality of the employee's judgment. Further, this rule prohibits participation in matters concerning previous employers if the employee had received an "extraordinary" payment after he had decided to leave to join the government.

Unlike the thrust of the preceding section, this rule deals not with actual conflicts, but with the appearance of conflict. The scope of relationships is broader, including any household member or relative. Further, recently terminated situations such as that with a previous employer, or one's leadership within a special interest group or professional organization, must be considered.

Seeking Other Employment

Employees are prohibited from seeking employment with people or organizations which might be affected by the employee's performance of his official duties.



The term "seeking employment" is defined as any bilateral negotiations with a prospective employer, and includes sending unsolicited resumes. However, requesting a job application or rejecting a unsolicited employment overture is not considered a violation of this rule.

Misuse of Position

This standard includes four rules relating to misuse of public office for private gain, and use of non-public information, government property and official time.

First, an employee may not use his public office to gain advantage for himself, friends, relatives, or non-government associates. This includes real or implied endorsements of products

FIGURE 1. General Principles of Public Service

1. Public service is a public trust, requiring employees to place loyalty to the Constitution, the laws and ethical principles above private gain.
2. Employees shall not hold financial interests that conflict with the conscientious performance of duty.
3. Employees shall not engage in financial transactions using nonpublic government information or allow the improper use of such information to further any private interest.
4. An employee shall not, except as permitted...solicit or accept any gift or other item of monetary value from any person or entity seeking official act' 1 from, doing business with, or conducting activities regulated ' the employee's agency, or whose interests may be substantially affected by the performance or nonperformance of the employee's duties.
5. Employees shall put forth honest effort in the performance of their duties.
6. Employees shall not knowingly make unauthorized commitments or promises of any kind purporting to bind the government.
7. Employees shall not use public office for private gain.
8. Employees shall act impartially and not give preferential treatment to any private organization or individual.
9. Employees shall protect and conserve federal property and shall not use it for other than authorized activities.
10. Employees shall not engage in outside employment or activities, including seeking or negotiating for employment, that conflict with official Government duties and responsibilities.
11. Employees shall disclose waste, fraud, abuse, and corruption to appropriate authorities.
12. Employees shall satisfy in good faith their obligations as citizens, including all just financial obligations, especially those such as Federal, State, or local taxes that are imposed by law.
13. Employees shall adhere to all laws and regulations that provide equal opportunity for all Americans regardless of race, color, religion, sex, national origin, age, or handicap.
14. Employees shall endeavor to avoid any actions creating the appearance that they are violating the law or the ethical standards set forth in this part. Whether particular circumstances create an appearance that the law or these standards have been violated shall be determined from the perspective of a reasonable person with knowledge of the relevant facts.

or services, except as part of an agency's recognition program.

Second, an employee may not use non-public information to further his own interests, or those of another. "Non-public" means information that is exempt from disclosure, or that has not actually been released to the public.

Third, government property is to be used only for official purposes, according to law or regulation. This means that personal use of government computers, copying machines, etc., are not permitted, unless locally authorized.

Finally, employees are to use official time in an honest effort to perform official duties. Activities not directly related to one's duties may be pursued if properly authorized. This may include time spent as a union representative, or speaking at a professional association meeting.

Outside Activities

Employees may not engage in outside employment or uncompensated activities that conflict with their official duties.

Under this section several areas are addressed including outside employment, service as an expert witness, teaching, speaking and writing, and fundraising activities. The regulation included many examples which detailed fine shades of permissible and prohibited behavior. However, common to all areas is the requirement for prior approval before engaging in activities that might appear to create a conflict. Further, outside activities should not consume so much time or energy as to materially impair the employee's ability to perform his official duties.

As to teaching, speaking or writing, an employee may not receive compensation for doing so if it is related to his official duties. However, receiving pay for teaching a course that is part of an academic program is permitted, even though the subject may be related to his official duties.

The OGE did not publish rules concerning participation in professional associations. It did reserve a section for that subject, but there is no plan at this time for issuing that section. Therefore, individuals should rely on the rest of the standards for guidance, and any regulations agencies may issue on their own.

Conclusion

The new Standards of Ethical Conduct represent a major step in consolidating and clarifying the expected conduct of Executive Branch employees. Because it is also a comprehensive regulation, it is lengthy and detailed. However, basic principles underlying the rules are defensible as reasonable norms for public servants.

Program managers and other acquisition professionals, in particular, will agree they do have a public trust to protect and always should behave in a manner above reproach. They will find the new standards are not burdensome, but a help in the pursuit of an increased stature for themselves and all public employees.

FROM THE COMMANDANT

The New Face Of Acquisition Education

The Commandant of DSMC has many wonderful opportunities to impact defense acquisition. We all know of the courses run at DSMC which cover the gamut from the 20-week Program Management Course (PMC) to the four-week Acquisition Basics Course (ABC) to the one-week Fundamentals of Systems Management (FSAM). These courses have evolved over time to fill what we or members of the acquisition management community viewed as necessary to the education of individuals assigned to program management offices, staffs, etc. However, as most of you know, the Defense Acquisition Workforce Improvement Act (DAWIA) has changed the manner in which the Services identify educational/training requirements for acquisition personnel and DSMC is participating very actively in the revised process.

The DAWIA is the driving force behind establishment of the professional acquisition work force. There are several key steps in this process. The acquisition work force has been identified as the body of military and civil service personnel who participate in the tasks associated with acquisition of weapon systems. It includes all the disciplines required to accomplish these, a few of which are contracting, systems engineering, test and evaluation and acquisition management. For each of the disciplines, DOD has established a functional board to monitor the implementation and operation for the training, education and certification of the associated personnel.

As the Commandant of DSMC, I have been assigned the chairmanship of the functional board dealing with acquisition management, which includes all program managers. The board has been meeting for more than a year and is well along the track toward monitoring the management of people assigned to the acquisition management discipline. The initial effort is to identify the competencies which, when mastered, will qualify an individual for Level I, II, or III certification and associated billets. This effort will probably consume the remainder of the year. Members of the DSMC faculty have developed a draft matrix of competencies with the degree of proficiency, experience or education required in each competency for the various levels. This matrix is now being addressed by the career managers for each Service. Through them each Service will be given the opportunity to comment and recommend additions, deletions or modifications to the list of competencies. The completed matrix will give all members of the acquisition management function a road map for progression through their careers, and I think this will be a great step forward.

Once Service inputs have been collated, the functional board will provide the list of competencies to the schools responsible for educating the acquisition management personnel. The schools will be requested to compare curriculum to the competencies for associated level courses and where disagreement exists, the schools will be expected to adjust the curriculum. The functional board will be responsible for auditing the coherence between competencies, the level of student, and the curriculum of the mandatory courses.

As I stated in the beginning, I look on this as a great opportunity to interact with the acquisition management community under the auspices of my position as Commandant of DSMC. I am confident this effort will enhance greatly the future professionalism of our work force.

—RADM WILLIAM L. VINCENT, USN.